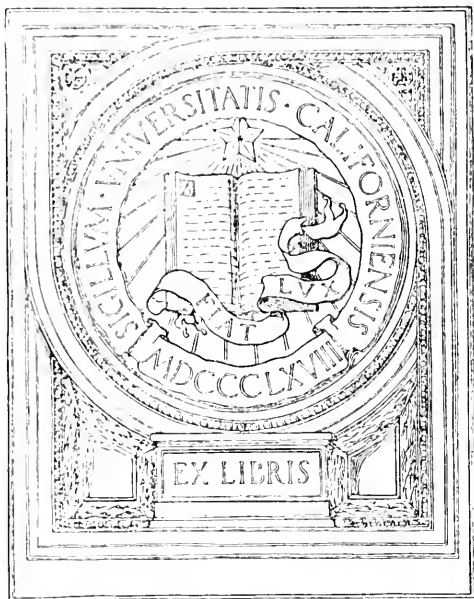
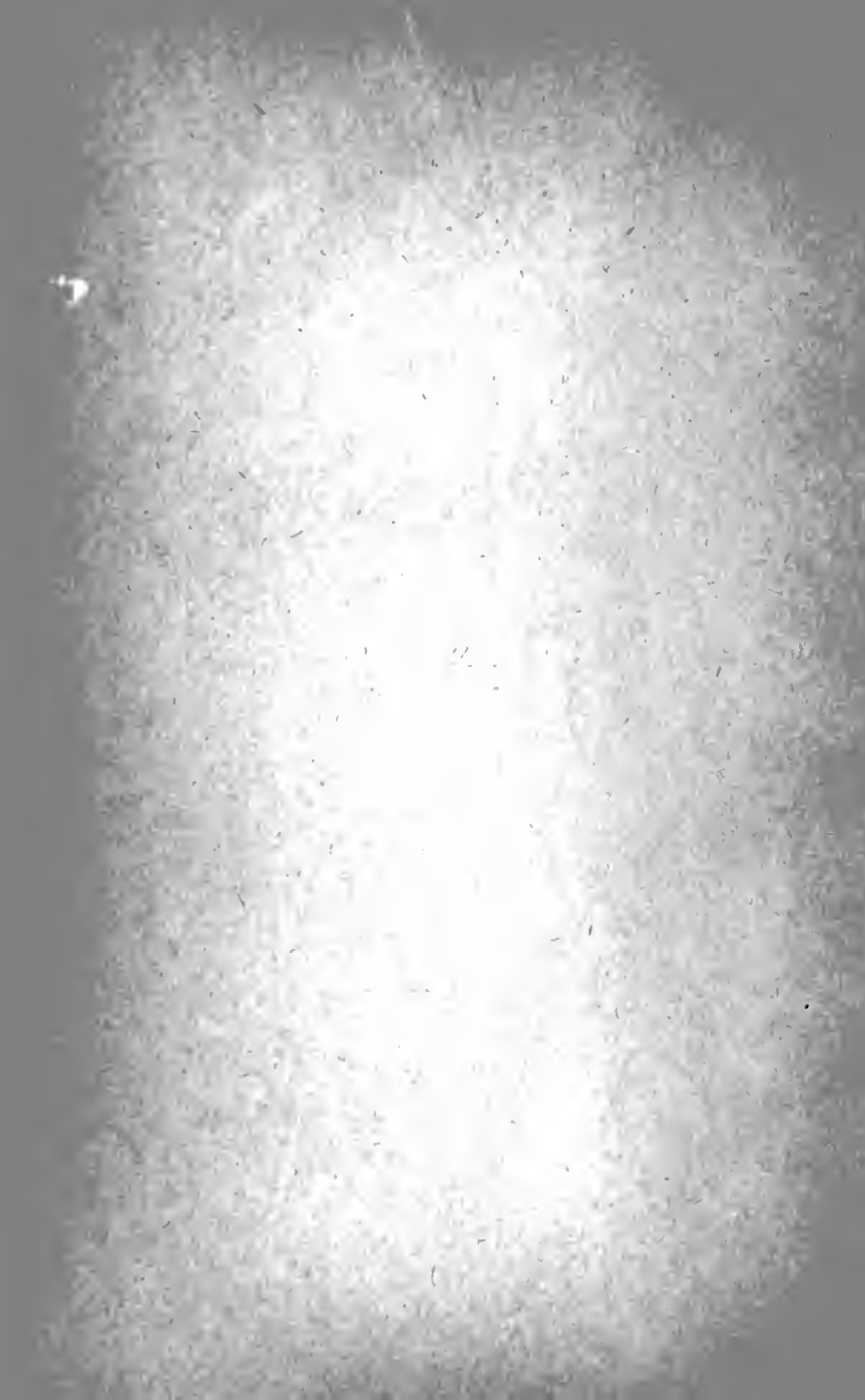


UNIVERSITY OF CALIFORNIA
AT LOS ANGELES



GIFT OF
Los Angeles Chapter
of the Order





Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation



1375/9

THE
AGRICULTURAL
HOLDINGS ACT, 1900.

BY
S. B. L. DRUCE,
BARRISTER-AT-LAW.

SECOND AND ENLARGED EDITION.

1101
A1008

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1901.

Price Sixpence.

FROM THE
JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND.
THIRD SERIES, VOL. FOR 1900.

ABSTRACTED TO VARIOUS
TRANSLATIONS IN
THE JOURNAL OF THE
ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE
AGRICULTURAL
HOLDINGS ACT 1900.

BY
S. B. L. DRUCE,
BARRISTER-AT-LAW.

SECOND AND ENLARGED EDITION.

LONDON :
JOHN MURRAY, ALBEMARLE STREET.
1901.

TABLE OF CONTENTS.

	PAGE
GENERAL EFFECT OF NEW ACT OF 1900.	3
SUGGESTED CONSOLIDATION ACT	3
CHIEF ALTERATIONS MADE BY NEW ACT	4
ALTERATIONS IN FIRST SCHEDULE	4
COMPENSATION UNDER ACT NOT EXCLUSIVE	5
ABOLITION OF NOTICE OF INTENDED CLAIM	6
ONE ARBITRATION SUFFICIENT IN ALL MATTERS BETWEEN OUTGOING TENANT AND LANDLORD	6
PROCEDURE	7
TENANT'S PROPERTY IN ACQUIRED FIXTURES	8
RIGHT OF ENTRY	9
PENAL RENTS	9
THE MARKET GARDENERS' COMPENSATION ACT, 1895	9
COMMENCEMENT OF THE ACT (1 JAN. 1901)	9
IMPROVEMENTS EXECUTED BEFORE THE ACT CAME INTO OPERATION	10

APPENDICES.

APPENDIX A.—TEXT OF THE NEW AGRICULTURAL HOLDINGS ACT, 1900 (63 & 64 Vict. c. 50)	11
FIRST SCHEDULE: SHOWING IMPROVEMENTS IN RESPECT OF WHICH (I.) CONSENT OF LANDLORD IS REQUIRED; (II.) NOTICE TO LANDLORD IS REQUIRED; (III.) CON- SENT OF OR NOTICE TO LANDLORD IS NOT REQUIRED	15
SECOND SCHEDULE: RULES AS TO ARBITRATION	16
THIRD SCHEDULE: ENACTMENTS REPEALED	19
APPENDIX B.—THE AGRICULTURAL HOLDINGS (ENGLAND) ACT, 1883, SO FAR AS NOW OPERATIVE, AS AMENDED BY THE AGRICULTURAL HOLDINGS ACT, 1900	20
IMPROVEMENTS EXECUTED AFTER THE COMMENCEMENT OF ACT	20
CHARGE OF TENANT'S COMPENSATION	24
NOTICE TO QUIT	25
FIXTURES	25
RESUMPTION FOR IMPROVEMENTS, AND MISCELLANEOUS	26
DISTRESS	27
GENERAL PROVISIONS	29
APPENDIX C.—FORMS OF AWARD PRESCRIBED BY THE BOARD OF AGRICULTURE	32
APPENDIX D.—FORMS OF PROCEEDINGS IN ARBITRATIONS.	36

THE AGRICULTURAL HOLDINGS ACT, 1900.



THE Agricultural Holdings Act of 1900, which came into force on January 1, 1901, differs from the existing Agricultural Holdings Acts mainly in two respects. First, it applies to Scotland as well as England, whereas each of these countries had formerly an Act to itself—there is a Scotch Agricultural Holdings Act, 1883, as well as an English Act of the same year; and secondly, the Act is an amending Act simply, and must be read as if incorporated into the existing Acts. It does not, like the English Act of 1883, wholly repeal the existing Acts, but is to be construed, so far as it affects Agricultural Holdings in England, with the English Act of 1883, and so far as it affects similar holdings in Scotland with the Scotch Act of the same year. Thus where there was a contract between a landlord and tenant under sec. 33 of the English Act of 1883 that a half-year's notice on either side should be necessary and sufficient to determine a tenancy, instead of the year's notice under that section, the new Act has made no difference, but the contract has the same validity now as it had before the new Act came into operation.

In this Paper I shall confine myself to the Act so far as it affects England, and shall not allude to it as it affects Scotland any further than to say that sec. 8 applies to Scotland only, sec. 10 directs how the Act is to apply to Scotland, sec. 12 repeals certain parts of the Scotch Act of 1883 and other Scotch Acts, and sec. 14, subsec. (3) directs that the Act, with the existing Scotch Acts, may be cited together as "The Agricultural Holdings (Scotland) Acts, 1883 to 1900;" and that as regards Scotland as well as England the Act amends the respective Market Gardeners' Compensation Acts relating to those countries.

The full text of the new Act is printed in Appendix A to this Paper, on pp. 11 to 19.

SUGGESTION OF CONSOLIDATION ACT.

During the time that the Bill for the new Act was passing through Parliament, many complaints were made both in the Houses of Parliament and out of them that the Bill was an

amending Bill only, and did not consolidate the existing Statute Law relating to compensation for improvements on Agricultural Holdings. Said an old and tried friend of the farmers, on one occasion when the Bill was being discussed, "This Bill refers to five Acts of Parliament; I think it repeals 30 clauses in these different Acts, and alters about twelve other clauses partially repealed! Surely what we want is a consolidated Act," and his remarks met with a loud chorus of approval.

To meet complaints such as these I have endeavoured to piece the new Act and the 1883 Act together, so as to make one document which should show the existing Statute Law on this subject by itself and without reference to any other.

My readers must clearly understand that this patchwork of mine, which they will find in Appendix B to this Paper, on pp. 20 to 31, is not an Act of Parliament, but merely the expression of my opinion of the way in which the new Act and the old Act when put together should be read. I have worked it out for the convenience of landlords, farmers, valuers, and others who are affected by the Acts, and to save them the trouble of referring to the different volumes of the Statutes in which the Acts are contained. For the sake of convenience as well as of brevity I have set out at length only those parts of the 1883 Act which are of general application, and referred merely to those parts which are less generally applicable: for instance, I have set out at length those parts which give tenants the right to compensation, but have merely referred to those parts which specially affect Crown, Duchy, Ecclesiastical, and Charity Lands. I have not noticed the Act of 1890, which relates to properties in mortgage only, and is unaltered by the new Act; and I have dealt with Market Gardens separately.

CHIEF ALTERATIONS MADE BY NEW ACT.

But I fear some of my readers may say "Yes, it is all very well for you to have set this piece of patchwork before us, but it is a complicated document, and we are not much, if any, wiser than we were before we read it; tell us, if you can, how the new Act has altered or improved the present position of landlords and tenants of agricultural land in England." I will endeavour to do so as briefly as possible.

ALTERATIONS IN FIRST SCHEDULE.

There are three additional improvements in respect of the making of which, without the consent of or notice to his landlord, a tenant is given a claim for compensation, viz.:

(a) The consumption on the holding "by horses other

than those regularly employed on the holding" of corn, cake, and feeding stuffs not produced on the holding ;

(b) "The consumption on the holding by cattle, sheep, or pigs, or by horses other than those regularly employed on the holding of corn, proved by satisfactory evidence to have been produced and consumed on the holding ;"

(c) "Laying down temporary pasture with clover, grass, lucerne, sainfoin, or other seeds sown more than two years prior to the determination of the tenancy."

The extension of the right to compensation for these three improvements has been very generally advocated during the last few years, and their inclusion in Part III. of the First Schedule to the Act will, I apprehend, be generally approved of.

The other alterations in the First Schedule are:—In Part I. the consent of the landlord is required to the "making or removal of permanent fences," and not only to the "making of fences," as in the old Schedule. This change seems proper, for there is no necessity to require a landlord's consent to the making of a temporary fence, while it is right and proper that permanent fences (which may be boundaries of an estate) should not be made or removed without the consent of the owner of the land. The consent of the landlord is also required to "protecting young fruit trees," and "the erection of wirework in hop gardens." Part II. remains unchanged ; while, "boning of land with undissolved bones" is excluded from Part III., it being considered, I apprehend, that such an operation is included in the item, "application to land of purchased artificial or other purchased manure." In the same part of the First Schedule to the item (20) "Claying of land" is added "or spreading blaes upon land," making this item run as it is in the existing Scotch Act. "Blaes" appear to be blue-coloured clay or soft slate, so that "spreading blaes" would seem to be very much like what we call claying in England.

COMPENSATION UNDER ACT NOT EXCLUSIVE.

The next important alteration made by the new Act is the repeal of the 57th section of the 1883 Act, and the new enactment, sec. 1, subsec. (5). "Nothing in this section shall prejudice the right of a tenant to claim any compensation to which he may be entitled under custom, agreement, or otherwise, in lieu of any compensation provided by this section." This is a most important provision, and entirely alters the present position, for under the 57th section of the Act of 1883, compensation under that Act is exclusive, that is to say, a tenant cannot obtain

compensation by custom or otherwise than in manner authorised by the Act, in respect of any improvement for which he is entitled to compensation under the Act. The alteration, I feel sure, is a change for the better, and will tend to make the Act much more popular; it will, at all events, make lawful that which is now done, though strictly unlawful, in very many parts of the country.

ABOLITION OF NOTICE OF INTENDED CLAIM.

Another benefit, in my opinion, conferred by the new Act is the abolition of the notice of claim by the tenant and of the notice of counterclaim by the landlord. The notice had to be given two months at least before the determination of the tenancy, and according to evidence given before the last Royal Commission on Agriculture was regarded "as one great cause of the unpopularity of the Act." As Mr. Read said, "If a tenant made a claim under the Act it was a sort of declaration of war against the landlord," and "every possible dilapidation and default on the part of the tenant were hunted up and brought against him." No notice of claim will for the future be required, and the tenant has until the determination of his tenancy to make his claim, but he cannot make it afterwards, except the claim relates to an improvement executed after that date while he lawfully remains in occupation of part of the holding, and in such case the claim must be made before he quits that part. This provision, which is contained in sec. 2, subsec. (2), and the provisions contained in subsec. (3) of the same section (which latter are too long to cite in full¹) will, I think, be found most beneficial. They should go a long way towards destroying that state of war between the parties of which the notice of claim was the signal, and ought to place an arbitration under the Act on the same footing as the ordinary valuation made on a change of tenancy.

ONE ARBITRATION SUFFICIENT IN ALL MATTERS BETWEEN OUTGOING TENANT AND LANDLORD.

Where the tenant's claim is referred to arbitration, he may, if he thinks fit and gives the prescribed notice to the landlord, require the arbitration to be extended to any claim for breach of contract or otherwise in respect of the holding which he may have against the landlord; and correlatively the landlord may, if he thinks fit, and gives the prescribed notice to the tenant, require the arbitration to be extended to any claim which he may have against the tenant in respect of any waste

¹ See *post*, p. 12.

wrongfully committed or permitted by the tenant, or in respect of breach of contract or otherwise in respect of the holding.

All matters in dispute between a landlord and outgoing tenant may, therefore, in the future be referred to one and the same tribunal, and be made the subject of a single award, a result which cannot fail to be attended with advantage. Moreover, the concluding words of subsec. (3) will render ineffective the decision *in re* Holmes and Formby,¹ in which it was held that where a greater amount was awarded to the landlord in respect of waste and breaches of covenant committed by the tenant than was awarded to the tenant as compensation for improvements, the landlord could not recover the balance under the procedure given by the Act of 1883. For the future, the new Act provides that any sum awarded to be paid by a landlord or a tenant shall be recoverable in manner provided by the 1883 Act for the recovery of compensation, that is, upon order made by the Judge of the County Court.

PROCEDURE.

Objection has been taken to the clause of the Act which enacts that "an arbitration shall, unless the parties otherwise agree, be before a single arbitrator." But it must be remembered that recourse to arbitration under the Act is not to be had until after failure of the parties to settle their differences between themselves, and in default of any agreement between them to submit to arbitration. It is not until both these methods of settlement have failed that arbitration under the Act comes in, and then it is open to the parties *not* to have a single arbitrator. In everyday practice I apprehend the outgoing tenant will consult a valuer just as he does now in respect of acts of husbandry and such-like matters, adding to these matters any claim he may consider himself entitled to for compensation under the Act; and the landlord on his side will consult a valuer, and this action will be evidence that the parties do not wish to have a single arbitrator, and they can then express that intention in writing, and so "agree in writing that there be not a single arbitrator." And the two valuers can become the arbitrators under the Act, and proceed accordingly.

It would be tedious and out of place here to consider in detail the new provisions relating to procedure, which are for the most part contained in the Second Schedule to the new Act. Suffice it to say that, speaking generally, the Board of Agriculture is substituted for the County Court as the authority to appoint an arbitrator or umpire in the cases where

¹ See this case, which is reported in the Journal R.A.S.E., for 1895 . 182.

an official appointment is necessary, and to give further time for making an award when further time is required. But the County Court is the authority by which an arbitrator or umpire who misconducts himself can be removed, and by which an award in a like case, or where an arbitration or award has been improperly procured, may be set aside.

The award need no longer specify the amount awarded in respect of any particular improvement or improvements, but, on the application of either party, it must do so. The award in all cases will be final as regards facts, but in matters of law a case may be stated (and must on the direction of the County Court Judge) for the opinion of that Court, and from the opinion of that Court an appeal lies to the Court of Appeal, but no farther. The award must be in such form as may be prescribed by the Board of Agriculture, but the arbitrators or umpire are not required to use forms for proceedings in arbitrations under the Act which may be prescribed by the Board, but such forms "shall, if used, be sufficient." Forms both of the Award and of the Proceedings in arbitrations have been prescribed by the Board, and will be found in Appendices C and D. The forms in C are obligatory, but those in D are not.

The 6th section of the 1883 Act is wholly repealed, and in lieu of the regulation it contained in reference to one of the reductions to be made in ascertaining the amount of compensation to be paid for the application of manures, or the consumption of feeding stuffs, the new Act (sec. 1, subsec. 4) enacts that in such cases "there shall be taken into account the value of the manure required by the contract of tenancy or by custom to be returned to the holding in respect of any crops sold off or removed from the holding within the last two years of the tenancy or other less time for which the tenancy has endured, not exceeding the value of the manure which would have been produced by the consumption on the holding of the crops so sold off or removed." And the proviso in the same section of the 1883 Act restricting the landlord's right to compensation in respect of waste by the tenant or of breach by the tenant committed or permitted in relation to a matter of husbandry more than four years before the determination of the tenancy is not re-enacted.

TENANT'S PROPERTY IN ACQUIRED FIXTURES.

Sec. 4 of the new Act confers a benefit on tenant farmers by giving them the property in and the right of removal of fixtures or buildings which they acquire, as well as the property in and right of removal of those which they affixed or erected themselves.

RIGHT OF ENTRY.

Sec. 5 confers upon landlords a statutory right of entry upon a holding for the purpose of ascertaining in what state it is. This right is always reserved in leases or agreements in writing, but is now for the first time made statutory.

PENAL RENTS.

By the 6th section of the Act, penal or higher rents or liquidated damages for the breach or non-fulfilment of a covenant or condition in a contract of tenancy to which the Act applies are abolished, and the landlord's right is restricted to the recovery of the damage actually suffered by him in consequence of such breach or non-fulfilment. But this restriction is not to apply to "any covenant or condition against breaking up permanent pasture, grubbing underwoods, or felling, cutting, lopping or injuring trees, or regulating the burning of heather." This alteration of the law appears just and reasonable, for while on the one hand the recovery of no more than the actual damage suffered meets the case of the breach of ordinary covenants such as those relating to everyday cultivation and sale of produce, yet, on the other hand, where it is impossible to estimate the damage suffered by a breach of a covenant, such as would be the case if in breach of a covenant not to break up rich pasture lands like the Leicestershire and Northamptonshire pastures, a tenant was to break them up, it is right and proper that he should be penalised for doing so.

THE MARKET GARDENERS' COMPENSATION ACT, 1895.

The only alteration that the new Act makes in the Act of 1895 is to repeal the paragraphs numbered (2) and (3) in the 3rd section, and in lieu of them to substitute item (27) of the First Schedule to the new Act. This item is split up into five subdivisions, of which (i) (ii) (iii) and (v) are exactly the same as the corresponding subdivisions of sec. (3) of the 1895 Act; but the new subdivision (iv) runs "Planting of asparagus, rhubarb and other vegetable crops which continue productive for two or more years," instead of, as in the old subdivision (iv) "Planting of asparagus and other vegetable crops."

COMMENCEMENT OF THE ACT.

The Agricultural Holdings Act, 1900 came into operation on January 1, 1901.

IMPROVEMENTS EXECUTED BEFORE THE ACT CAME INTO
OPERATION.

Sec. 7 of the Act enacts that the compensation in respect of an improvement made before the Act came into operation shall be such (if any) as could have been claimed if the Act had not been passed, but shall be ascertained in the manner provided by the Act.

The question has been raised whether it is necessary for a tenant to give two months' notice, before the expiration of his tenancy, of his intention to claim compensation for improvements so executed; and the better opinion seems to be that it is not necessary for him to do so, for the giving such notice is a matter of procedure, and falls within the concluding words of the section; and, moreover, the 7th section of the Act of 1883, which made the giving of such notice obligatory, has been repealed by the new Act.

Another and more difficult question has been raised in reference to these improvements, namely, whether a tenant who quits his farm within two years after the Act came into operation has the right to claim compensation for laying down temporary pasture with clover or other seeds before the Act came into operation. Several commentators on the Act are of opinion that a tenant has no such right; but it is hard to say that this opinion is correct. It seems to me to be one of considerable legal nicety, which cannot be absolutely settled except by judicial decision. In the meantime, no tenant should make such a claim or landlord resist one except upon legal advice.

Other points, as regards claims for compensation in respect of improvements executed before the Act, will no doubt arise in practice, but they will soon be cured by time—*edax rerum*.

S. B. L. DRUCE.

April 1901.

APPENDIX A.

[*Note.*—The marginal notes to the Act are printed in italics.]

THE AGRICULTURAL HOLDINGS ACT, 1900.

[63 & 64 VICT. CH. 50.]

AN ACT TO AMEND THE LAW RELATING TO AGRICULTURAL
HOLDINGS. [8TH AUGUST, 1900.]

BE it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows :—

1. *Right of tenant to compensation for improvements.*—
(1.) Where a tenant has made on his holding any improvement comprised in the First Schedule to this Act he shall, subject as in the Agricultural Holdings (England) Act, 1883, 46 & 47 Vict. c. 61 (in this Act referred to as the principal Act), and in this Act mentioned, be entitled, at the determination of a tenancy, on quitting his holding to obtain from the landlord as compensation under the said Acts for the improvement such sum as fairly represents the value of the improvement to an incoming tenant. Provided always, that in estimating the value of any such improvement there shall not be taken into account, as part of the improvement made by the tenant, what is justly due to the inherent capabilities of the soil.

(2.) References in the principal Act to the First Schedule to that Act shall be construed as references to the First Schedule to this Act.

(3.) In the ascertainment of the amount of the compensation payable to a tenant under the principal Act or this Act there shall be taken into account any benefit which the landlord has given or allowed to the tenant in consideration of the tenant executing the improvement.

(4.) In the ascertainment of the amount of the compensation payable to a tenant in respect of manures as defined by this Act, there shall be taken into account the value of the manure required by the contract of tenancy or by custom to be returned to the holding in respect of any crops sold off or removed from the holding

within the last two years of the tenancy or other less time for which the tenancy has endured, not exceeding the value of the manure which would have been produced by the consumption on the holding of the crops so sold off or removed.

(5.) Nothing in this section shall prejudice the right of a tenant to claim any compensation to which he may be entitled under custom, agreement, or otherwise, in lieu of any compensation provided by this section.

2. Settlement of differences by arbitration.—(1.) If a tenant claims to be entitled to compensation, whether under the principal Act or this Act, or under custom, agreement, or otherwise, in respect of any improvement comprised in the First Schedule to this Act, and if the landlord and tenant fail to agree as to the amount and time and mode of payment of such compensation, the difference shall be settled by arbitration in accordance with the provisions, if any, in that behalf in any agreement between landlord and tenant, and in default of and subject to any such provisions by arbitration under this Act in accordance with the provisions set out in the Second Schedule to this Act.

(2.) Any claim by a tenant for compensation under the principal Act or this Act in respect of any improvement comprised in the First Schedule to this Act shall not be made after the determination of the tenancy. Provided that where the claim relates to an improvement executed after the determination of the tenancy, but while the tenant lawfully remains in occupation of part of the holding, the claim may be made at any time before the tenant quits that part.

(3.) Where any claim by a tenant for compensation in respect of any improvement comprised in the First Schedule to this Act is referred to arbitration, and any sum is claimed to be due to the tenant from the landlord in respect of any breach of contract or otherwise in respect of the holding, or to the landlord from the tenant in respect of any waste wrongfully committed or permitted by the tenant, or in respect of breach of contract or otherwise in respect of the holding, the party claiming such sum may, if he thinks fit, by written notice to the other party given by registered letter or otherwise not later than seven days after the appointment of the arbitrator or arbitrators, require that the arbitration shall extend to the determination of the further claim, and thereupon the provisions of this section with respect to arbitration shall apply accordingly, and any sum awarded to be paid by a landlord or tenant shall be recoverable in manner provided by the principal Act for the recovery of compensation.

(4.) Where any claim which is referred to arbitration relates to an improvement executed or matter arising after the determination of the tenancy, but while the tenant lawfully remains in occupation of part of the holding, the arbitrator may, if he thinks fit, make a separate award in respect of such claim.

(5.) An arbitration shall, unless the parties otherwise agree, be before a single arbitrator.

(6.) If in any arbitration under this Act the arbitrator states a case for the opinion of the County Court on any question of law, the opinion of the court on any question so stated shall be final, unless within the time and in accordance with the conditions prescribed by rules of the Supreme Court either party appeals to the Court of Appeal, from whose decision no appeal shall lie.

(7.) Any person who wilfully and corruptly gives false evidence before an arbitrator or umpire in any arbitration under this Act shall be guilty of perjury, and may be dealt with, prosecuted, and punished accordingly.

(8.) Subject to any provision contained in any agreement between landlord and tenant the Arbitration Act, 1889 (52 & 53 Vict. c. 49), shall not apply to any arbitration to which this Act applies.

3. Land charges.—(1.) The powers of the County Court under the principal Act with respect to charges shall be exercised by the Board of Agriculture, and accordingly the Board of Agriculture shall be substituted for the County Court in sections twenty-nine, thirty, thirty-one, thirty-two, and thirty-nine of that Act.

(2.) Where a charge may be made under the principal Act or this Act for compensation, the person making the award shall, as the request and cost of the party entitled to obtain the charge, certify the amount to be charged and the term for which the charge may properly be made, having regard to the time at which each improvement in respect of which compensation is awarded is to be deemed to be exhausted.

(3.) Sections twenty-nine, thirty, and thirty-one of the principal Act shall apply to any money paid by or due from a landlord to a tenant as compensation for any improvement comprised in the First Schedule to this Act, whether the compensation be claimed under this Act or under custom or agreement or otherwise.

(4.) A charge made by the Board of Agriculture pursuant to this section shall be a land charge within the meaning of the Land Charges Registration and Searches Act, 1887 (51 & 52 Vict. c. 51), and may be registered accordingly. This subsection shall not apply to Scotland.

4. Fixtures and buildings.—The provisions of section thirty-four of the principal Act shall apply to a fixture or building acquired by a tenant in like manner as they apply to a fixture or building affixed or erected by a tenant.

5. Power of entry.—The landlord of a holding or any person authorised by him may at all reasonable times enter on the holding, or any part of it, for the purpose of viewing the state of the holding.

6. Penal rents and liquidated damages.—Notwithstanding any provision in a contract of tenancy making the tenant liable to pay a higher rent or other liquidated damages in the event of any breach

or nonfulfilment of a covenant or condition, a landlord shall not be entitled to recover, by distress or otherwise, any sum in consequence of any breach or nonfulfilment of any such covenant or condition in excess of the damage actually suffered by him in consequence of the breach or nonfulfilment. Provided that this section shall not apply to any covenant or condition against breaking up permanent pasture, grubbing underwoods, or felling, cutting, lopping, or injuring trees, or regulating the burning of heather.

7. *Improvements executed before Act comes into operation.*—The compensation in respect of an improvement made before this Act comes into operation shall be such (if any) as could have been claimed if this Act had not been passed, but shall be ascertained in the manner provided by this Act.

8. *Notice of termination of tenancy.*—From and after the passing of this Act notice of termination of tenancy under section twenty-eight of the Agricultural Holdings (Scotland) Act, 1883 (46 & 47 Vict. c. 62), may be given in the same manner as a notice of removal under section six of the Removal Terms (Scotland) Act, 1886 (49 & 50 Vict. c. 50).

9. *Interpretation.*—(1.) References to “manures” in the principal Act and this Act shall be construed as references to the improvements numbered twenty-three, twenty-four, and twenty-five in Part III. of the First Schedule to this Act.

(2.) This Act shall be construed as one with the principal Act.

10. *Application to Scotland.*—In the application of this Act to Scotland—

(1.) References to the principal Act and to sections twenty-nine, thirty, thirty-two, and thirty-four thereof shall be construed as references to the Agricultural Holdings (Scotland) Act, 1883 (46 & 47 Vict. c. 92), and to sections twenty-four, twenty-five, twenty-six, and thirty thereof respectively. References to sections thirty-one and thirty-nine of the principal Act shall not apply :

(2.) A reference to the Arbitration Act, 1889, shall be construed as a reference to the Arbitration (Scotland) Act, 1894 (57 & 58 Vict. c. 13), and a reference to the Market Gardeners’ Compensation Act, 1895, shall be construed as a reference to the Market Gardeners’ Compensation (Scotland) Act, 1897 (60 & 61 Vict. c. 29) :

(3.) The expression “either division of the Court of Session” shall be substituted for “Court of Appeal,” “sheriff” for “county court” or “judge of a county court,” “auditor of the sheriff court” for “registrar of the county court,” “Act of Sederunt” for “Rules of the Supreme Court,” “arbiter” and “arbiters” for “arbitrator” and “arbitrators,” “oversman” for “umpire,” “deterioration” for “waste,” and “expenses” for “costs” :

(4.) Any award or agreement as to compensation, and any other award under this Act, may be competently recorded for execution in the books of council and session or sheriff court books, and shall be enforceable in like manner as a recorded decree arbitral.

(5.) Where any jurisdiction committed by the principal Act or this Act to the sheriff is exercised by the sheriff-substitute there shall be no appeal to the sheriff.

11. *Extent of Act.*—This Act shall not extend to Ireland.

12. *Repeal.*—The enactments specified in the Third Schedule to this Act are hereby repealed to the extent mentioned in the third column of that schedule.

13. *Commencement of Act.*—This Act shall come into operation on the first day of January one thousand nine hundred and one.

14. *Short titles.*—(1.) This Act may be cited as the Agricultural Holdings Act, 1900.

(2.) The Agricultural Holdings (England) Act, 1883, the Tenants' Compensation Act, 1890 (53 & 54 Vict. c. 57), the Market Gardeners' Compensation Act, 1895 (58 & 59 Vict. c. 27), and this Act, may be cited together as the Agricultural Holdings (England) Acts, 1883 to 1900.

(3.) The Agricultural Holdings (Scotland) Act, 1883, the Market Gardeners' Compensation (Scotland) Act, 1897, and this Act may be cited together as the Agricultural Holdings (Scotland) Acts, 1883 to 1900.

SCHEDULES.

FIRST SCHEDULE.

(The new parts are printed in italics.)

PART I.

IMPROVEMENTS TO WHICH CONSENT OF LANDLORD IS REQUIRED.

- (1.) Erection or enlargement of buildings.
- (2.) Formation of silos.
- (3.) Laying down of permanent pasture.
- (4.) Making and planting of osier beds.
- (5.) Making of water meadows or works of irrigation.
- (6.) Making of gardens.
- (7.) Making or improving of roads or bridges.
- (8.) Making or improving of watercourses, ponds, wells, or reservoirs, or of works for the application of water power or for supply of water for agricultural or domestic purposes.
- (9.) Making *or removal* of permanent fences.
- (10.) Planting of hops.
- (11.) Planting of orchards or fruit bushes.
- (12.) *Protecting young fruit trees.*
- (13.) Reclaiming of waste land.

- (14.) *Warping or weiring of land.*
- (15.) *Embankments and sluices against floods.*
- (16.) *The erection of wirework in hop gardens.*
[*N.B.—This part is subject as to market gardens to the provisions of Part III.*]

PART II.

IMPROVEMENT IN RESPECT OF WHICH NOTICE TO LANDLORD IS REQUIRED.

- (17.) *Drainage.*

PART III.

IMPROVEMENTS IN RESPECT OF WHICH CONSENT OF OR NOTICE TO LANDLORD IS NOT REQUIRED.

- (18.) *Chalking of land.*
- (19.) *Clay-burning.*
- (20.) *Claying of land, or spreading blaes upon land.*
- (21.) *Liming of land.*
- (22.) *Marling of land.*
- (23.) *Application to land of purchased artificial or other purchased manure.*
- (24.) *Consumption on the holding by cattle, sheep, or pigs, or by horses other than those regularly employed on the holding, of corn, cake, or other feeding-stuff not produced on the holding.*
- (25.) *Consumption on the holding by cattle, sheep, or pigs, or by horses other than those regularly employed on the holding, of corn proved by satisfactory evidence to have been produced and consumed on the holding.*
- (26.) *Laying down temporary pasture with clover, grass, lucerne, sainfoin, or other seeds sown more than two years prior to the determination of the tenancy.*
- (27.) *In the case of a holding as to which section three of the Market Gardeners' Compensation Act, 1895 (58 & 59 Vict., c. 27) applies—*
 - (i.) *Planting of standard or other fruit trees permanently set out ;*
 - (ii.) *Planting of fruit bushes permanently set out ;*
 - (iii.) *Planting of strawberry-plants ;*
 - (iv.) *Planting of asparagus, rhubarb, and other vegetable crops which continue productive for two or more years ;*
 - (v.) *Erection or enlargement of buildings for the purpose of the trade or business of a market gardener.*

SECOND SCHEDULE.

RULES AS TO ARBITRATION.

PART I.

ARBITRATION BEFORE A SINGLE ARBITRATOR.

1. *Appointment of Arbitrator.*—A person agreed upon between the parties, or in default of agreement nominated by the Board of Agriculture on the application in writing of either of the parties, shall be appointed arbitrator.

2. If a person appointed arbitrator dies, or is incapable of acting, or for seven days after notice from either party requiring him to act fails to act, a new arbitrator may be appointed as if no arbitrator had been appointed.

3. Neither party shall have power to revoke the appointment of the arbitrator without the consent of the other party.

4. Every appointment, notice, revocation, and consent under this part of these rules must be in writing.

5. *Time for Award.*—The arbitrator shall make and sign his award within twenty-eight days of his appointment or within such longer period as the Board of Agriculture may (whether the time for making the award has expired or not) direct.

6. *Removal of Arbitrator.*—Where an arbitrator has misconducted himself the county court may remove him.

7. *Evidence.*—The parties to the arbitration, and all persons claiming through them respectively, shall, subject to any legal objection, submit to be examined by the arbitrator, on oath or affirmation, in relation to the matters in dispute, and shall, subject as aforesaid, produce before the arbitrator all samples, books, deeds, papers, accounts, writings, and documents, within their possession or power respectively which may be required or called for, and do all other things which during the proceedings the arbitrator may require.

8. The arbitrator shall have power to administer oaths, and to take the affirmation of parties and witnesses appearing, and witnesses shall, if the arbitrator thinks fit, be examined on oath or affirmation.

9. *Statement of Case.*—The arbitrator may at any stage of the proceedings, and shall, if so directed by the judge of a county court (which direction may be given on the application of either party), state in the form of a special case for the opinion of that court any question of law arising in the course of the arbitration.

10. *Award.*—The arbitrator shall on the application of either party specify the amount awarded in respect of any particular improvement or improvements, and the award shall fix a day not sooner than one month nor later than two months after the delivery of the award for the payment of money awarded for compensation, costs, or otherwise, and shall be in such form as may be prescribed by the Board of Agriculture.

11. The award to be made by the arbitrator shall be final and binding on the parties and the persons claiming under them respectively.

12. The arbitrator may correct in an award any clerical mistake or error arising from any accidental slip or omission.

13. When an arbitrator has misconducted himself, or an arbitration or award has been improperly procured, the county court may set the award aside.

14. *Costs.*—The costs of and incidental to the arbitration and award shall be in the discretion of the arbitrator, who may direct to and by whom and in what manner these costs or any part thereof are to be paid, and the costs shall be subject to taxation by the registrar of the county court on the application of either party, but that taxation shall be subject to review by the judge of the county court.

15. The arbitrator shall, in awarding costs, take into consideration the reasonableness or unreasonableness of the claim of either party, either in respect of amount or otherwise, and any unreasonable demand for particulars or refusal to supply particulars, and generally all the circumstances of the case, and may disallow the costs of any witness whom he considers to have been called unnecessarily, and any other costs which he considers to have been incurred unnecessarily.

16. *Forms.*—Any forms for proceedings in arbitrations under this Act which may be prescribed by the Board of Agriculture shall, if used, be sufficient.

PART II.

ARBITRATION BEFORE TWO ARBITRATORS OR AN UMPIRE.

1. *Appointment of Arbitrators and Umpire.*—If the parties agree in writing that there be not a single arbitrator, each of them shall appoint an arbitrator.

2. If before award one of two arbitrators dies or is incapable of acting, or for seven days after notice from either party requiring him to act fails to act, the party appointing him shall appoint another arbitrator.

3. Notice of every appointment of an arbitrator by either party shall be given to the other party.

4. If for fourteen days after notice by one party to the other to appoint an arbitrator, or another arbitrator, the other party fails to do so, then, on the application of the party giving notice, the Board of Agriculture shall appoint a person to be an arbitrator.

5. Where two arbitrators are appointed, then (subject to the provisions of these rules) they shall, before they enter on the arbitration, appoint an umpire.

6. If before award an umpire dies, or is incapable of acting, or for seven days after notice from either party requiring him to act fails to act, the arbitrators may appoint another umpire.

7. If for seven days after request from either party the arbitrators fail to appoint an umpire, or another umpire, then, on the application of either party, the Board of Agriculture shall appoint a person to be the umpire.

8. Neither party shall have power to revoke an appointment of an arbitrator without the consent of the other.

9. Every appointment, notice, request, revocation, and consent under this part of these rules shall be in writing.

10. *Time for Award.*—The arbitrators shall make and sign their award in writing within twenty-eight days after the appointment of the last appointed of them, or on or before any later day to which the arbitrators, by any writing signed by them, may enlarge the time for making the award, not being more than forty-nine days from the appointment of the last appointed of them.

11. If the arbitrators have allowed their time or extended time to expire without making an award, or have delivered to either party or to the umpire a notice in writing stating that they cannot agree, the umpire may forthwith enter on the arbitration in lieu of the arbitrators.

12. The umpire shall make and sign his award within one month after the original or extended time appointed for making the award of the arbitrators has expired.

13. The time for making an award may from time to time be extended by the Board of Agriculture, whether the time for making the award has expired or not.

14. *Removal of Arbitrator, Evidence, Statement of Case, Award, Costs, Forms.*—The provisions of Part I. of these rules as to the removal of an arbitrator, the evidence, the statement of a case, the award, costs, and forms shall apply to an arbitration in accordance with this Part as if the expression "arbitrator" whenever used in those provisions included two arbitrators or an umpire, as the case may require.

THIRD SCHEDULE.

ENACTMENTS REPEALED.

Session and chapter	Short title	Extent of repeal
46 & 47 Vict. c. 61.	The Agricultural Holdings (England) Act, 1883	Section one. Sections six to sixteen. Section seventeen from "and the award shall" to the end of the section. Sections eighteen to twenty-three. In section twenty-four the words "or ordered on appeal" and the words "or ordered." Section twenty-nine from "where an award has been made" to "improvement will." Section fifty-seven. The definition of "manures" in section sixty-one. The First Schedule.
46 & 47 Vict. c. 62.	The Agricultural Holdings (Scotland) Act, 1883.	Section one. Sections six to eight. Sections eleven to fifteen. Section sixteen from the beginning thereof to "within the county," and from "and the award shall" to the end of the section. Sections seventeen to twenty. In section twenty-one the words "or ordered on appeal," and the words "or ordered." Section twenty-four from "where an award has been made" to "improvement will." Section thirty-eight. The Schedule.
52 & 53 Vict. c. 20.	The Agricultural Holdings (Scotland) Act, 1889.	The whole Act.
58 & 59 Vict. c. 27.	The Market Gardeners' Compensation Act, 1895.	In section three the paragraphs numbered (2) and (3).
60 & 61 Vict. c. 22.	The Market Gardeners' Compensation (Scotland) Act, 1897.	In section three the paragraphs numbered (2) and (3).

APPENDIX B

THE AGRICULTURAL HOLDINGS (ENGLAND)
ACT, 1883, SO FAR AS NOW OPERATIVE, AS
AMENDED BY THE AGRICULTURAL HOLD-
INGS ACT, 1900.

[*Note.*—The provisions of the new Act are printed in italics.]

PART I.

IMPROVEMENTS.

SEC. 1 of the 1883 Act is repealed and the following subsection of section 1 of the new Act is substituted for it, viz. :—

1. (1.) *Where a tenant has made on his holding any improvement comprised in the First Schedule to this Act he shall, subject as in the Agricultural Holdings (England) Act, 1883 (in this Act referred to as the principal Act), and in this Act mentioned, be entitled, at the determination of a tenancy, on quitting his holding to obtain from the landlord as compensation under the said Acts for the improvement such sum as fairly represents the value of the improvement to an incoming tenant. Provided always, that in estimating the value of any such improvement there shall not be taken into account, as part of the improvement made by the tenant, what is justly due to the inherent capabilities of the soil.*

Section 2 relates to improvements executed before the commencement of the Act of 1883, and therefore need not be set forth.

IMPROVEMENTS EXECUTED AFTER THE COMMENCEMENT
OF ACT.

3. Compensation under this Act shall not be payable in respect of any improvement mentioned in the first part of the First Schedule to the Act of 1900, and executed after the commencement of this Act, unless the landlord, or his agent duly authorised in that

behalf, has, previously to the execution of the improvement and after the passing of this Act, consented in writing to the making of such improvement, and any such consent may be given by the landlord unconditionally, or upon such terms as to compensation, or otherwise, as may be agreed upon between the landlord and the tenant, and in the event of any agreement being made between the landlord and the tenant, any compensation payable thereunder shall be deemed to be substituted for compensation under this Act.

4. Compensation under this Act shall not be payable in respect of any improvement mentioned in the second part of the First Schedule to the Act of 1900, and executed after the commencement of this Act, unless the tenant has, not more than three months and not less than two months before beginning to execute such improvement, given to the landlord, or his agent duly authorised in that behalf, notice in writing of his intention so to do, and of the manner in which he proposes to do the intended work, and upon such notice being given, the landlord and tenant may agree on the terms as to compensation or otherwise on which the improvement is to be executed, and in the event of any such agreement being made, any compensation payable thereunder shall be deemed to be substituted for compensation under this Act, or the landlord may, unless the notice of the tenant is previously withdrawn, undertake to execute the improvement himself, and may execute the same in any reasonable and proper manner which he thinks fit, and charge the tenant with a sum not exceeding five pounds per centum per annum on the outlay incurred in executing the improvement, or not exceeding such annual sum payable for a period of twenty-five years as will repay such outlay in the said period, with interest at the rate of three per centum per annum, such annual sum to be recoverable as rent. In default of any such agreement or undertaking, and also in the event of the landlord failing to comply with his undertaking within a reasonable time, the tenant may execute the improvement himself, and shall in respect thereof be entitled to compensation under this Act.

The landlord and tenant may, if they think fit, dispense with any notice under this section, and come to an agreement in a lease or otherwise between themselves in the same manner and of the same validity as if such notice had been given.

5. Where, in the case of a tenancy under a contract of tenancy current at the commencement of this Act, any agreement in writing or custom, or the Agricultural Holdings (England) Act, 1875, provides specific compensation for any improvement comprised in the First Schedule to the Act of 1900, compensation in respect of such improvement, although executed after the commencement of this Act, shall be payable in pursuance of such agreement, custom, or Act of Parliament, and shall be deemed to be substituted for compensation under this Act.

Where, in the case of a tenancy under a contract of tenancy beginning after the commencement of this Act, any particular agreement in writing secures to the tenant for any improvement mentioned in the third part of the First Schedule to the Act of 1900, and executed after the commencement of this Act, fair and reasonable compensation, having regard to the circumstances existing at the time of making such agreement, then in such case the compensation in respect of such improvement shall be payable in pursuance of the particular agreement, and shall be deemed to be substituted for compensation under this Act.

The last preceding provision of this section relating to a particular agreement shall apply in the case of a tenancy under a contract of tenancy current at the commencement of this Act in respect of an improvement mentioned in the third part of the First Schedule to the Act of 1900, specific compensation for which is not provided by any agreement in writing, or custom, or the Agricultural Holdings Act, 1875.

Sections 6 to 16 inclusive, comprising REGULATIONS AS TO COMPENSATION FOR IMPROVEMENTS, and as to PROCEDURE, are repealed, and the following substituted for them :—

1. (3.) *In the ascertainment of the amount of the compensation payable to a tenant under the principal Act or this Act there shall be taken into account any benefit which the landlord has given or allowed to the tenant in consideration of the tenant executing the improvement.*

(4.) *In the ascertainment of the amount of the compensation payable to a tenant in respect of manures as defined by this Act there shall be taken into account the value of the manure required by the contract of tenancy or by custom to be returned to the holding in respect of any crops sold off or removed from the holding within the last two years of the tenancy or other less time for which the tenancy has endured, not exceeding the value of the manure which would have been produced by the consumption on the holding of the crops so sold off or removed.*

2. (1.) *If a tenant claims to be entitled to compensation, whether under the principal Act or this Act, or under custom, agreement, or otherwise in respect of any improvement comprised in the First Schedule to this Act, and if the landlord and tenant fail to agree as to the amount and time and mode of payment of such compensation, the difference shall be settled by arbitration in accordance with the provisions, if any, in that behalf in any agreement between landlord and tenant, and in default of and subject to any such provisions by arbitration under this Act in accordance with the provisions set out in the Second Schedule to this Act.*

(2.) *Any claim by a tenant for compensation under the principal Act or this Act in respect of any improvement comprised in the First Schedule to this Act shall not be made after the determination of the*

tenancy. Provided that where the claim relates to an improvement executed after the determination of the tenancy, but while the tenant lawfully remains in occupation of part of the holding, the claim may be made at any time before the tenant quits that part.

(3.) Where any claim by a tenant for compensation in respect of any improvement comprised in the First Schedule to this Act is referred to arbitration, and any sum is claimed to be due to the tenant from the landlord in respect of any breach of contract or otherwise in respect of the holding, or to the landlord from the tenant in respect of any waste wrongfully committed or permitted by the tenant, or in respect of breach of contract or otherwise in respect of the holding, the party claiming such sum may, if he thinks fit, by written notice to the other party given by registered letter or otherwise not later than seven days after the appointment of the arbitrator or arbitrators, require that the arbitration shall extend to the determination of the further claim, and thereupon the provisions of this section with respect to arbitration shall apply accordingly, and any sum awarded to be paid by a landlord or tenant shall be recoverable in manner provided by the principal Act for the recovery of compensation.

(4.) Where any claim which is referred to arbitration relates to an improvement executed or matter arising after the determination of the tenancy, but while the tenant lawfully remains in occupation of part of the holding, the arbitrator may, if he thinks fit, make a separate award in respect of such claim.

(5.) An arbitration shall, unless the parties otherwise agree, be before a single arbitrator.

17. In any case provided for by sections three, four, or five, if compensation is claimed under this Act, such compensation as under any of those sections is to be deemed to be substituted for compensation under this Act, if and so far as the same can, consistently with the terms of the agreement, if any, be ascertained by the referees or the umpire, shall be awarded in respect of any improvements thereby provided for.

Secs. **18 to 23** are also repealed, and in lieu of the last section, which related to appeals to a County Court, the following subsection of section 2 of the new Act is substituted :—

(6.) If in any arbitration under this Act the arbitrator states a case for the opinion of the County Court on any question of law, the opinion of the court on any question so stated shall be final, unless within the time and in accordance with the conditions prescribed by rules of the Supreme Court either party appeals to the Court of Appeal, from whose decision no appeal shall lie.

And the following subsection of section 2 is the substituted enactment relative to persons giving false evidence :—

(7.) Any person who wilfully and corruptly gives false evidence before an arbitrator or umpire in any arbitration under this Act

shall be guilty of perjury, and may be dealt with, prosecuted, and punished accordingly.

The following subsection of section 2 is new :—

(8.) Subject to any provision contained in any agreement between landlord and tenant the Arbitration Act, 1889, shall not apply to any arbitration to which this Act applies.

24. Where any money agreed or awarded to be paid for compensation, costs, or otherwise, is not paid within fourteen days after the time when it is agreed or awarded to be paid, it shall be recoverable, upon order made by the Judge of the County Court, as money ordered by a county court under its ordinary jurisdiction to be paid is recoverable.

Sec. 25, which contains provisions for the appointment of guardian, in cases where a landlord or tenant is an infant or of unsound mind, not so found by inquisition ; and sec. 26, which contains provisions respecting married women, are not altered, but do not appear to be of sufficient general importance to be set forth at length.

27. The costs of proceedings in the county court under this Act shall be in the discretion of the court.

The Lord Chancellor may from time to time prescribe a scale of costs for those proceedings, and of costs to be taxed by the registrar of the court.

28. Any notice, request, demand, or other instrument under this Act may be served on the person to whom it is to be given, either personally or by leaving it for him at his last known place of abode in England, or by sending it through the post in a registered letter addressed to him there ; and if so sent by post it shall be deemed to have been served at the time when the letter containing it would be delivered in ordinary course ; and in order to prove service by letter it shall be sufficient to prove that the letter was properly addressed and posted, and that it contained the notice, request, demand, or other instrument to be served.

CHARGE OF TENANT'S COMPENSATION.

Sections 29, 30, 31, and 32 are not altered, except that the Board of Agriculture is substituted for the County Court as the authority from whom the charges to which the sections relate may be obtained, and except by the following subsections of section 3 of the new Act, viz. :—

(2.) Where a charge may be made under the principal Act or this Act for compensation, the person making the award shall, at the request and cost of the party entitled to obtain the charge, certify the amount to be charged and the term for which the charge may properly be made, having regard to the time at which each improvement in respect of which compensation is awarded is to be deemed to be exhausted.

(3.) *Sections twenty-nine, thirty, and thirty-one of the principal Act shall apply to any money paid by or due from a landlord to a tenant as compensation for any improvement comprised in the First Schedule to this Act, whether the compensation be claimed under this Act or under custom or agreement or otherwise.*

(4.) *A charge made by the Board of Agriculture pursuant to this section shall be a land charge within the meaning of the Land Charges Registration and Searches Act, 1888, and may be registered accordingly.*

NOTICE TO QUIT.

33. Where a half year's notice, expiring with a year of tenancy, is by law necessary and sufficient for determination of a tenancy from year to year, in the case of any such tenancy under a contract of tenancy made either before or after the commencement of this Act, a year's notice so expiring shall by virtue of this Act be necessary and sufficient for the same, unless the landlord and tenant of the holding, by writing under their hands, agree that this section shall not apply, in which case a half year's notice shall continue to be sufficient; but nothing in this section shall extend to a case where the tenant is adjudged bankrupt, or has filed a petition for a composition or arrangement with his creditors.

FIXTURES.

34. Where after the commencement of this Act a tenant affixes to his holding *or acquires* any engine, machinery, fencing, or other fixture, or erects *or acquires* any building for which he is not under this Act or otherwise entitled to compensation, and which is not so affixed or erected *or acquired* in pursuance of some obligation in that behalf, or instead of some fixture or building belonging to the landlord, then such fixture or building shall be the property of and be removable by the tenant before or within a reasonable time after the termination of the tenancy.

Provided as follows :—

1. Before the removal of any fixture or building the tenant shall pay all rent owing by him, and shall perform or satisfy all other his obligations to the landlord in respect to the holding :
2. In the removal of any fixture or building the tenant shall not do any avoidable damage to any other building or other part of the holding :
3. Immediately after the removal of any fixture or building the tenant shall make good all damage occasioned to any other building or other part of the holding by the removal :
4. The tenant shall not remove any fixture or building without giving one month's previous notice in writing to the landlord of the intention of the tenant to remove it :

5. At any time before the expiration of the notice of removal the landlord, by notice in writing given by him to the tenant, may elect to purchase any fixture or building comprised in the notice of removal, and any fixture or building thus elected to be purchased shall be left by the tenant, and shall become the property of the landlord, who shall pay the tenant the fair value thereof to an incoming tenant of the holding ; and any difference as to the value shall be settled by a reference under this Act, as in case of compensation (but without appeal).

Sections 35 to 40 of the 1883 Act relating to Crown, Duchy, Ecclesiastical, and Charity Lands remain unaltered, except that the Board of Agriculture is substituted for the County Court as the authority by whom a charge on the holding for moneys paid by the Governors of Queen Anne's Bounty in respect of an improvement may be made.

RESUMPTION FOR IMPROVEMENTS, AND MISCELLANEOUS.

41. Where on a tenancy from year to year a notice to quit is given by the landlord with a view to the use of land for any of the following purposes :

The erection of farm labourers' cottages or other houses, with or without gardens ;

The providing of gardens for existing farm labourers' cottages or other houses ;

The allotment for labourers of land for gardens or other purposes ;

The planting of trees ;

The opening or working of any coal, ironstone, limestone, or other mineral, or of a stone quarry, clay, sand, or gravel pit, or the construction of any works or buildings to be used in connexion therewith ;

The obtaining of brick earth, gravel, or sand ;

The making of a watercourse or reservoir ;

The making of any road, railway, tramroad, siding, canal, or basin, or any wharf, pier, or other work connected therewith ;

and the notice to quit so states, then it shall, by virtue of this Act, be no objection to the notice that it relates to part only of the holding.

In every such case the provisions of this Act respecting compensation shall apply as on determination of a tenancy in respect of an entire holding.

The tenant shall also be entitled to a proportionate reduction of rent in respect of the land comprised in the notice to quit, and in respect of any depreciation of the value to him of the residue of the holding, caused by the withdrawal of that land from the holding or by the use to be made thereof, and the amount of that reduction shall be ascertained by agreement or settled by a reference under this Act, as in case of compensation (but without appeal).

The tenant shall further be entitled, at any time within twenty-

eight days after service of the notice to quit, to serve on the landlord a notice in writing to the effect that he (the tenant) accepts the same as a notice to quit the entire holding, to take effect at the expiration of the then current year of tenancy ; and the notice to quit shall have effect accordingly.

42. Subject to the provisions of this Act in relation to Crown, Duchy, Ecclesiastical, and Charity Lands, a landlord, whatever may be his estate or interest in his holding, may give any consent, make any agreement, or do or have done to him any act in relation to improvements in respect of which compensation is payable under this Act which he might give, or make, or do, or have done to him if he were in the case of an estate of inheritance owner thereof in fee, and in the case of a leasehold possessed of the whole estate in the leasehold.

43. When, by any Act of Parliament, deed, or other instrument, a lease of a holding is authorised to be made, provided that the best rent, or reservation in the nature of rent, is by such lease reserved, then, whenever any lease of a holding is, under such authority, made to the tenant of the same, it shall not be necessary, in estimating such rent or reservation, to take into account against the tenant the increase (if any) in the value of such holding arising from any improvements made or paid for by him on such holding.

PART II.

DISTRESS.

44. After the commencement of this Act it shall not be lawful for any landlord entitled to the rent of any holding to which this Act applies to distrain for rent, which became due in respect of such holding, more than one year before the making of such distress, except in the case of arrears of rent in respect of a holding to which this Act applies existing at the time of the passing of this Act, which arrears shall be recoverable by distress up to the first day of January 1885 to the same extent as if this Act had not passed.

Provided that where it appears that according to the ordinary course of dealing between the landlord and tenant of a holding the payment of the rent of such holding has been allowed to be deferred until the expiration of a quarter of a year or half a year after the date at which such rent legally became due, then for the purpose of this section the rent of such holding shall be deemed to have become due at the expiration of such quarter or half year as aforesaid, as the case may be, and not at the date at which it legally became due.

45. Where live stock belonging to another person has been taken in by the tenant of a holding to which this Act applies to be fed at a fair price agreed to be paid for such feeding by the owner of such stock to the tenant, such stock shall not be distrained by the landlord for rent where there is other sufficient distress to be found,

and if so distrained by reason of other sufficient distress not being found, there shall not be recovered by such distress a sum exceeding the amount of the price so agreed to be paid for the feeding, or if any part of such price has been paid exceeding the amount remaining unpaid, and it shall be lawful for the owner of such stock, at any time before it is sold, to redeem such stock by paying to the distrainer a sum equal to such price as aforesaid, and any payment so made to the distrainer shall be in full discharge as against the tenant of any sum of the like amount which would be otherwise due from the owner of the stock to the tenant in respect of the price of feeding: Provided always, that so long as any portion of such live stock shall remain on the said holding the right to distrain such portion shall continue to the full extent of the price originally agreed to be paid for the feeding of the whole of such live stock, or if part of such price has been *bonâ fide* paid to the tenant under the agreement, then to the full extent of the price then remaining unpaid.

Agricultural or other machinery which is the *bonâ fide* property of a person other than the tenant, and is on the premises of the tenant under a *bonâ fide* agreement with him for the hire or use thereof in the conduct of his business, and live stock of all kinds which is the *bonâ fide* property of a person other than the tenant, and is on the premises of the tenant solely for breeding purposes, shall not be distrained for rent in arrear.

46. Where any dispute arises—

- (a) in respect of any distress having been levied contrary to the provisions of this Act; or
- (b) as to the ownership of any live stock distrained, or as to the price to be paid for the feeding of such stock; or
- (c) as to any other matter or thing relating to a distress on a holding to which this Act applies:

such dispute may be heard and determined by the county court or by a court of summary jurisdiction, and any such county court or court of summary jurisdiction may make an order for restoration of any live stock or things unlawfully distrained, or may declare the price agreed to be paid in the case where the price of the feeding is required to be ascertained, or may make any other order which justice requires: any such dispute as mentioned in this section shall be deemed to be a matter in which a court of summary jurisdiction has authority by law to make an order on complaint in pursuance of the Summary Jurisdiction Acts; but any person aggrieved by any decision of such court of summary jurisdiction under this section may, on giving such security to the other party as the court may think just, appeal to a court of general or quarter sessions.

47. Where the compensation due under this Act, or under any custom or contract, to a tenant has been ascertained before the landlord distrains for rent due, the amount of such compensation may be set off against the rent due, and the landlord shall not be entitled to distrain for more than the balance.

48. An order of the County Court or of a Court of summary jurisdiction under this Act shall not be quashed for want of form, or be removed by certiorari or otherwise into any superior court.

Sections 49 to 52 and the Second Schedule relating to the same subject were repealed by the Law of Distress Amendment Act, 1888, which in effect extended the provisions contained in them to all classes of holdings.

PART III.

GENERAL PROVISIONS.

Section 53 prescribed the date of the commencement of the Act.

54. Nothing in this Act shall apply to a holding that is not either wholly agricultural or wholly pastoral, or in part agricultural, and as to the residue pastoral, or in whole or in part cultivated as a market garden, or to any holding let to the tenant during his continuance in any office, appointment, or employment held under the landlord.

55. Any contract, agreement, or covenant made by a tenant, by virtue of which he is deprived of his right to claim compensation under this Act in respect of any improvement mentioned in the First Schedule to the Act of 1900 (except an agreement providing such compensation as is by this Act permitted to be substituted for compensation under this Act), shall, so far as it deprives him of such right, be void both at law and in equity.

56. Where an incoming tenant has, with the consent in writing of his landlord, paid to an outgoing tenant any compensation payable under or in pursuance of this Act in respect of the whole or part of any improvement, such incoming tenant shall be entitled on quitting the holding to claim compensation in respect of such improvement or part in like manner, if at all, as the outgoing tenant would have been entitled if he had remained tenant of the holding, and quitted the holding at the time at which the incoming tenant quits the same.

Sec. 57 is repealed—it provided that compensation under the Act of 1883 was to be exclusive, but now under sec. 1, subsec. (5) of the new Act, *nothing in this section shall prejudice the right of a tenant to claim any compensation to which he may be entitled under custom, agreement, or otherwise, in lieu of any compensation provided by this section.*

58. A tenant who has remained in his holding during a change or changes of tenancy shall not thereafter on quitting his holding at the determination of a tenancy be deprived of his right to claim compensation in respect of improvements by reason only that such improvements were made during a former tenancy or tenancies, and not during the tenancy at the determination of which he is quitting.

59. Subject as in this section mentioned, a tenant shall not be entitled to compensation in respect of any improvements, other than manures as defined by this Act, begun by him, if he holds from year to year, within one year before he quits his holding, or at any time after he has given or received final notice to quit, and, if he holds as a lessee, within one year before the expiration of his lease.

A final notice to quit means a notice to quit which has not been waived or withdrawn, but has resulted in the tenant quitting his holding.

The foregoing provisions of this section shall not apply in the case of any such improvement as aforesaid—

- (1.) Where a tenant from year to year has begun such improvement during the last year of his tenancy, and, in pursuance of a notice to quit thereafter given by the landlord, has quitted his holding at the expiration of that year; and
- (2.) Where a tenant, whether a tenant from year to year or a lessee, previously to beginning any such improvement, has served notice on his landlord of his intention to begin the same, and the landlord has either assented or has failed for a month after the receipt of the notice to object to the making of the improvement.

60. Except as in this Act expressed, nothing in this Act shall take away, abridge, or prejudicially affect any power, right, or remedy of a landlord, tenant, or other person vested in or exercisable by him by virtue of any other Act or law, or under any custom of the country, or otherwise, in respect of a contract of tenancy or other contract, or of any improvements, waste, emblements, tillages, away-going crops, fixtures, tax, rate, tithe rentcharge, rent, or other thing.

61. In this Act—

“Contract of tenancy” means a letting of or agreement for the letting land for a term of years, or for lives, or for lives and years, or from year to year :

A tenancy from year to year under a contract of tenancy current at the commencement of the Act shall for the purposes of this Act be deemed to continue to be a tenancy under a contract of tenancy current at the commencement of this Act until the first day on which either the landlord or tenant of such tenancy could, the one by giving notice to the other immediately after the commencement of this Act, cause such tenancy to determine, and on and after such day as aforesaid shall be deemed to be a tenancy under a contract of tenancy beginning after the commencement of this Act :

“Determination of tenancy” means the cesser of a contract of tenancy by reason of effluxion of time, or from any other cause :

“Landlord” in relation to a holding means any person for the time being entitled to receive the rents and profits of any holding :

“Tenant” means the holder of land under a landlord for a term of years, or for lives, or for lives and years, or from year to year :

“Tenant” includes the executors, administrators, assigns, legatee, devisee, or next-of-kin, husband, guardian, committee of the estate or trustees in bankruptcy of a tenant, or any person deriving title from a tenant ; and the right to receive compensation in respect of any improvement made by a tenant shall enure to the benefit of such executors, administrators, assigns, and other persons as aforesaid :

“Holding” means any parcel of land held by a tenant :

“County court,” in relation to a holding, means the county court within the district whereof the holding or the larger part thereof is situate :

“Person” includes a body of persons and a corporation aggregate or sole :

“Live stock” includes any animal capable of being distrained.

The definition of “manures” in this section is repealed and the following substituted for it, viz. :—

9. (1.) *References to “manures” in the principal Act and this Act shall be construed as references to the improvements numbered twenty-three, twenty-four, and twenty-five in Part III. of the First Schedule to this Act.*

The designations of landlord and tenant shall continue to apply to the parties until the conclusion of any proceedings taken under or in pursuance of this Act in respect of compensation for improvements, or under any agreement made in pursuance of this Act.

The remaining sections 62-64 of the 1883 Act need not be cited, but the following sections of the new Act, which contain quite new provisions, must be :—

5. *The landlord of a holding or any person authorised by him may at all reasonable times enter on the holding, or any part of it, for the purpose of viewing the state of the holding.*

6. *Notwithstanding any provision in a contract of tenancy making the tenant liable to pay a higher rent or other liquidated damages in the event of any breach or nonfulfilment of a covenant or condition, a landlord shall not be entitled to recover, by distress or otherwise, any sum in consequence of any breach or nonfulfilment of any such covenant or condition in excess of the damage actually suffered by him in consequence of the breach or nonfulfilment. Provided that this section shall not apply to any covenant or condition against breaking up permanent pasture, grubbing underwoods, or felling, cutting, lopping, or injuring trees, or regulating the burning of heather.*

7. *The compensation in respect of an improvement made before this Act comes into operation shall be such (if any) as could have been claimed if this Act had not been passed, but shall be ascertained in the manner provided by this Act.*

APPENDIX C.

BOARD OF AGRICULTURE RULES

(Dated December 7, 1900).

FORM A.

*Form of Award prescribed by the Board of Agriculture.*AGRICULTURAL HOLDINGS (ENGLAND) ACTS,
1883 TO 1900.

In the matter of a holding known as¹
lately in the occupation of A.B., of (the
quitting tenant).

To all to whom these presents shall come I, F.G., of
of , [we, F.G., of , and H.K.,
] send greeting.

Whereas C.D., the landlord of the above-mentioned holding, and
the said A.B., the tenant thereof, have failed to agree as to the
amount and time and mode of payment of the compensation to
which the said A.B. claims to be entitled in respect of the improve-
ments made on the above-mentioned holding, which are comprised
in the First Schedule to this Award.

*(Here insert recitals of appointments of Arbitrator, Arbitrators,
or Umpire. See Forms B, C, and D [on page 35].)*

And whereas the said A.B., by written notice to the said C.D.,
has required that the arbitration shall extend to the determination
of certain further claims by the said A.B. against the said C.D. in
respect of the said holding, the short particulars of which claims
are set forth in the Second Schedule to this Award.

And whereas the said C.D., by written notice to the said A.B.,
has required that the arbitration shall extend to the determination
of certain claims by the said C.D. against the said A.B. in respect
of the said holding, the short particulars of which claims are set
forth in the Third Schedule to this Award.

And whereas the said A.B. [or C.D.] has applied to me [us] to
specify the amount awarded in respect of such of the improve-
ments comprised in the First Schedule to this Award as are in such
Schedule marked with an asterisk.

¹ Insert name (if any) and description of holding.

And whereas the time for making my [our] Award has been extended by the Board of Agriculture to the day of
 , 19 ,

or

And whereas we have duly enlarged the time for making our Award to the day of , 19 .

Now know ye that I, the said F.G. [we, the said F.G. and H.K.], having taken upon myself [ourselves] the burden of the said reference, and having heard, examined, and considered the witnesses and evidence concerning the said matters so referred to me [us] as aforesaid, do make and publish this my [our] Award of and concerning the same in manner following, that is to say :—

1. I [We] award and determine that the said A.B. is entitled to receive from the said C.D. the sum of pounds shillings and pence, as compensation in respect of the improvements comprised in the First Schedule to this Award, and I [we] do hereby declare that the amounts awarded by me [us] in respect of such of the said improvements as are marked with an asterisk are the amounts set against such improvements in such Schedule.

2. I [We] award and determine that the said A.B. is entitled to receive from the said C.D. the sum of pounds shillings and pence in respect of the claims mentioned in the Second Schedule to this Award.

3. I [We] award and determine that the said C.D. is entitled to receive from the said A.B. the sum of pounds shillings and pence in respect of the claims mentioned in the Third Schedule to this Award.

4.* I [We] award and determine that the said sum[s] of pounds shillings and pence [and pounds shillings and pence] awarded by me [us] shall, subject to the provisions of the Agricultural Holdings (England) Acts, 1883 to 1900, be paid by the said C.D. to the said A.B. on the day after the delivery of this Award ; and that the said sum of pounds shillings and pence awarded by me [us] shall, subject as aforesaid, be paid by the said A.B. to the said C.D. on the same day.

5.* I [We] award and direct that the costs of and incidental to the arbitration and this Award shall be paid by the said A.B. [or C.D. or by the said A.B. and C.D.] in the following proportions, namely, part thereof by the said A.B. and part thereof by the said C.D. [or otherwise as may be directed], or I [We] award and direct that each party shall bear his own costs of and incidental to this arbitration, and shall pay part of my [our] costs of this Award, and that any costs payable by the one party

* The date in paragraphs 4 and 5 must not be earlier than one calendar month, nor later than two calendar months, after the delivery of the award.

to the other party under or by virtue of this Award shall be so paid on the day after the delivery of this Award.

In witness whereof I [we] have hereunto set my [our] hand[s]
this day of 19 .

Signed by the said F.G. [and H.K.] in the presence of
F.G.
[H.K.]

THE FIRST SCHEDULE REFERRED TO IN THE ABOVE-
WRITTEN AWARD.

(Here insert each of the improvements comprised in the First Schedule to the Agricultural Holdings Act, 1900, in respect of which a claim by the tenant has been referred to arbitration. If either party has required that the amount awarded in respect of any particular improvement shall be specified, the person or persons making the Award will mark such improvement with an asterisk, and place against the improvement the amount awarded in respect thereof.)

THE SECOND SCHEDULE REFERRED TO IN THE ABOVE-
WRITTEN AWARD.

(Here insert short particulars of any further claim by the tenant to which he has by written notice required that the arbitration shall extend.)

THE THIRD SCHEDULE REFERRED TO IN THE ABOVE-
WRITTEN AWARD.

(Here insert short particulars of any claim by the landlord to which he has by written notice required that the arbitration shall extend.)

NOTE.—The Award may be endorsed as follows :—

This Award was delivered to A.B. [or C.D.] on the day
of 19 .

F.G.
[H.K.]

FORM B.

(Recital of Appointment of a Single Arbitrator.)

And whereas by an appointment, dated the day of , 19 , signed by the said A.B. and C.D. [or sealed by the Board of Agriculture, *as the case may be*], I, the said F.G., was duly appointed under the Agricultural Holdings (England) Acts, 1883 to 1900, to act as Arbitrator for the purpose of settling the said differences, in accordance with the provisions set out in the Second Schedule to the Agricultural Holdings Act, 1900.

FORM C.

(Recital of Appointment of Two Arbitrators.)

And whereas by two appointments, dated respectively the day of 19 , and the day of , 19 , we, the said F.G. and H.K., were duly appointed under the Agricultural Holdings (England) Acts, 1883 to 1900, to act as Arbitrators for the purpose of settling the said differences, in accordance with the provisions set out in the Second Schedule to the Agricultural Holdings Act, 1900.

FORM D.

(Recital of Appointment of Umpire.)

(After recital of appointment of two arbitrators, M.N. and P.Q.)

And whereas by an appointment, dated the day of , 19 , signed by the said M.N. and P.Q. [or sealed by the Board of Agriculture, *as the case may be*], I, the said F.G., was duly appointed under the said Acts to act as Umpire in the said arbitration.

[And whereas the said M.N. and P.Q. duly enlarged the time for making their award to the day of , 19 .]¹

And whereas the said M.N. and P.Q. have allowed their time to expire without making an award [or, *as the case may be*, have delivered to the said A.B. or C.D. or to me, the said F.G., a notice in writing stating that they cannot agree].

¹ Omit if there has been no such extension.

APPENDIX D.

FORM E.

*(Application for Appointment by Board of Agriculture
of a single Arbitrator.)*

AGRICULTURAL HOLDINGS (ENGLAND) ACTS
1883 TO 1900.

TO THE BOARD OF AGRICULTURE.

In the matter of the holding known as¹ _____, lately in
the occupation of A.B., of _____ *(the quitting tenant).*

Whereas the said A.B. claims to be entitled to compensation
in respect of certain improvements made on the above-mentioned
holding.

And whereas C.D., of _____, the landlord of the said holding,
and the said A.B., have failed to agree as to the amount and time
and mode of payment of such compensation, and as to the person
to act as arbitrator for the purpose of settling the differences that
have so arisen.

And whereas there is not any provision in any agreement
between the said A.B. and C.D. relating to the appointment of such
arbitrator, and such arbitrator may accordingly be appointed by
the Board of Agriculture on the application in writing of either of
the parties.

Now I, the said A.B. [*or C.D.*], do hereby apply to the Board of
Agriculture for the appointment by them of an arbitrator for the
purpose of settling the said differences.

(Signature of A.B. or C.D., or his duly authorized agent.)

NOTE.—*Delay in making the appointment will be avoided if the
application is signed by or on behalf of both parties.*

¹ Insert name (if any) and description of holding.

FORM F.

*(Application for Appointment by Board of Agriculture of Arbitrator
for party failing to appoint.)*

AGRICULTURAL HOLDINGS (ENGLAND) ACTS,
1883 TO 1900.

TO THE BOARD OF AGRICULTURE.

In the matter of the holding known as¹ , lately in the
occupation of A.B., of *(the quitting tenant).*

Whereas the said A.B. claims to be entitled to compensation in
respect of certain improvements made on the above-mentioned
holding.

And whereas C.D., of , the landlord of the said holding,
and the said A.B. have failed to agree as to the amount and time
and mode of payment of such compensation.

And whereas by writing, dated the , the said parties
agreed, in effect, that the differences which have so arisen should be
settled by two arbitrators or an umpire.

And whereas the said A.B. [or C.D.] has, for fourteen days after
notice by the said C.D. [or A.B.] to him to appoint an arbitrator,
failed to do so.

And whereas there is not any provision in any agreement
between the said A.B. and C.D. relating to the appointment of an
arbitrator for or on behalf of the said A.B. [or C.D.], in case of such
default as aforesaid, and such arbitrator may accordingly be ap-
pointed by the Board of Agriculture.

Now I, the said A.B. [or C.D.], do hereby apply to the Board of
Agriculture for the appointment by them of an arbitrator for or on
behalf of the said C.D. [or A.B.]

(Signature of A.B. or C.D., or his duly authorized agent.)

FORM G.

(Application for appointment by Board of Agriculture of Umpire.)

AGRICULTURAL HOLDINGS (ENGLAND) ACTS,
1883 TO 1900.

TO THE BOARD OF AGRICULTURE.

In the matter of the holding known as¹ , lately in the
occupation of A.B., of *(the quitting tenant).*

Whereas the said A.B. claims to be entitled to compensation in
respect of certain improvements made on the above-mentioned hold-
ing.

¹ Insert name (if any) and description of holding.

And whereas C.D., of _____, the landlord of the said holding, and the said A.B. have failed to agree as to the amount and time and mode of payment of such compensation.

And whereas by writing, dated the _____, the said parties agreed in effect that the differences which have so arisen should be settled by two arbitrators or an umpire.

And whereas M.N., of _____, and P.Q., of _____, having been duly appointed to be the arbitrators for the purpose of settling the said differences, have for seven days after a request in writing in that behalf by the said A.B. [*or C.D.*] failed to appoint an umpire.

And whereas there is not any provision in any agreement between the said A.B. and C.D. relating to the appointment of an umpire in case of such default as aforesaid, and such umpire may accordingly be appointed by the Board of Agriculture.

Now I, the said A.B. [*or C.D.*], do hereby apply to the Board of Agriculture for the appointment by them of an umpire for the purpose of such arbitration.

(Signature of A.B. *or* C.D., or his duly authorised agent.)

NOTE.—*Delay in making the appointment will be avoided if the application is signed by or on behalf of both parties.*

FORM H.

(*Application to Board of Agriculture for extension of time for Award.*)

AGRICULTURAL HOLDINGS (ENGLAND) ACTS, 1883 TO 1900.

TO THE BOARD OF AGRICULTURE.

In the matter of an arbitration under the above-mentioned Acts between A.B., of _____ (*the quitting tenant*), and C.D., of _____ (*the landlord*), relating to the holding known as ¹ _____, lately in the occupation of the said A.B.

Whereas the time for making the Award in the said arbitration will expire [*or expired*] on the _____ day of _____, 19 ____.

Now I, the undersigned, do hereby apply to the Board of Agriculture to extend the time for making the said Award to the day of _____, 19 ____.

[This may be signed by an arbitrator, or by an umpire, where the matter is referred to him, or in any case by either party to the arbitration or his duly authorized agent.]

¹ Insert name (if any) and description of holding.

PRINTED BY
SPOTTISWOODE AND CO. LTD., NEW-STREET SQUARE
LONDON



SIXTH EDITION
(TWENTY-SIXTH THOUSAND)
OF

Elements of Agriculture

A TEXT-BOOK

PREPARED UNDER THE AUTHORITY OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

By W. FREAM, LL.D.

CONTENTS.

PART I.—THE SOIL.

1. ORIGIN AND PROPERTIES OF SOILS.
2. COMPOSITION AND CLASSIFICATION OF SOILS.
3. SOURCES OF LOSS AND OF GAIN TO SOILS
4. MOISTURE IN SOILS.
5. IMPROVEMENT OF SOILS.
6. TILLAGE.
7. IMPLEMENTS FOR WORKING SOILS.
8. MANURES AND MANURING.

PART II.—THE PLANT.

9. SEEDS AND THEIR GERMINATION.
10. STRUCTURE AND FUNCTIONS OF PLANTS
11. CULTIVATED PLANTS.
12. WEEDS.
13. SELECTION OF SEEDS.
14. IMPLEMENTS FOR SECURING CROPS.
15. GRASS LAND AND ITS MANAGEMENT
16. FARM CROPS.
17. FUNGUS PESTS
18. INSECT PESTS

PART III.—THE ANIMAL.

19. STRUCTURE AND FUNCTIONS OF FARM ANIMALS.
20. COMPOSITION OF THE ANIMAL BODY.
21. FOODS AND FEEDING.
22. THE ART OF BREEDING.
23. HORSES: THEIR BREEDS, FEEDING, AND MANAGEMENT.
24. CATTLE: THEIR BREEDS, FEEDING, AND MANAGEMENT
25. SHEEP: THEIR BREEDS, FEEDING, AND MANAGEMENT.
26. PIGS: THEIR BREEDS, FEEDING, AND MANAGEMENT.
27. THE FATTENING OF CATTLE, SHEEP, AND PIGS.
28. DAIRYING.

INDEX OF PLANTS.
GENERAL INDEX.

Of all Booksellers.

486 pages, with 256 Illustrations.

Price THREE SHILLINGS AND SIXPENCE, bound in cloth.

LONDON: JOHN MURRAY, 50A ALBEMARLE STREET, W.

PAMPHLETS AND DIAGRAMS

PUBLISHED BY THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

TEXT-BOOK ON AGRICULTURE.

ELEMENTS OF AGRICULTURE: a Text-Book prepared under the authority of the Royal Agricultural Society of England by W. FREAM, B.Sc., LL.D. 486 pp. with 256 Illustrations. Twenty-six Thousand. Price 3s. 6d. bound in cloth.

PAMPHLETS.

VETERINARY PAMPHLETS BY SIR GEORGE BROWN, O.B. :

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS.

Fourth Edition (1895). 64 pp. With Sixty Illustrations. Price 1s.

ANIMALS OF THE FARM IN HEALTH AND DISEASE. 72 pp.

With 62 Illustrations. Third Edition (1895). Price 1s.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHORING. 20 pp. Third Edition (1892). With Twelve Plates. Price 6d.

CONTAGIOUS FOOT-ROT IN SHEEP (1892). 16 pp. 8 Illustrations. Price 6d.

OTHER VETERINARY PAMPHLETS :

THE MARE AND FOAL. By Professor J. WORTLEY AXE, M.R.O.V.S. 58 pp. With Twenty Illustrations (1898). Price 1s.

THE LAMBING PEN. By HAROLD LEENEY. 3rd Ed. (1897). With 9 Illustrations. Price 6d.

ABORTION IN CATTLE. Report of the Special Committee appointed by the Council, with Minutes of Evidence, and Appendices. 88 pp. (1894). Price 1s.

PAMPHLETS BY MR. CHARLES WHITEHEAD, F.L.S., F.G.S. :

HINTS ON VEGETABLE AND FRUIT FARMING. Fourth and Enlarged Edition (1893). With Seven Illustrations. 53 pp. Price 6d.

METHODS OF PREVENTING AND CHECKING THE ATTACKS OF INSECTS AND FUNGI. With Twenty-six Illustrations (1891). 40 pp. Price 6d.

HOP CULTIVATION. With Thirteen Illustrations (1893). 48 pp. Price 1s.

DAIRY PAMPHLETS :

(Issued under the authority of the Dairy Committee of the Society.)

THE PRACTICE OF (a) CHEDDAR, (b) CHESHIRE, AND (c) STILTON CHEESE MAKING. Price 2d. each.

SIMPLE RULES FOR BUTTER MAKING. Revised May 1896. (Sheet.) Price 1d. each, or 5s. per 100. Mounted on card and varnished, to hang up in the Dairy, 6d. each. (These Rules can also be had in the Welsh Language.)

OTHER PAMPHLETS :

TABLES FOR ESTIMATING DEAD WEIGHT AND VALUE OF CATTLE FROM LIVE WEIGHT. By the late Sir JOHN B. LAWES, Bart. Price 1s.

TECHNICAL EDUCATION IN AGRICULTURE. By W. FREAM, B.Sc., LL.D. With Two Reports by the Education Committee of the Royal Agricultural Society of England. Second Edition (1891). 24 pp. Price 6d.

THE DRYING OF FRUIT AND VEGETABLES. By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 4 Illustrations (1897). 26 pp. Price 3d.

REPORT ON THE WOBURN POT-CULTURE STATION. By Dr. J. AUGUSTUS VOELCKER, M.A., F.R.C. With 17 Illustrations (1900). 52 pp. Price 2s. 6d.

HEDGES AND HEDGE MAKING. By W. J. MALDEN. With 10 Illustrations (1899). 32 pp. Price 6d.

THE MAKING OF THE LAND IN ENGLAND. By ALBERT PRILL. (1899.) 27 pp. Price 6d.

COTTAGE SANITATION IN RURAL DISTRICTS. By H. MACLEAN WILSON, M.D., B.Sc. With a Preface by T. PRIDGIN TEALE, F.R.S. New and Enlarged Edition. 32 pp., 12 Illustrations (1896). Price 3d. per copy; 2s. per doz.; 12s. 6d. per 100.

THE AGRICULTURAL HOLDINGS ACT, 1900. By S. B. L. DRUCE. Second and Enlarged Edition (1901). 38 pp. Price 6d.

LIST OF GOVERNORS AND MEMBERS OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND. Corrected to 31st December, 1898. 186 pp. Price 2s. 6d. to Members; 5s. to Non-Members.

The above can be obtained at the Society's House, 13 Hanover Square, London, W.; or of Mr. JOHN MURRAY, 50a Albemarle Street, W.

COLOURED DIAGRAMS.

Obtainable from Messrs. W. & A. K. Johnston, 5 White Hart Street, Warwick Lane, E.C., or Edinburgh.)

DIAGRAMS OF INJURIOUS INSECTS. Drawn from Nature by the late Miss GEORGINA E. ORMEROD, in conjunction with Miss ELEANOR A. ORMEROD, F.R.Met.Soc. Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d.

EIGHT DIAGRAMS REPRESENTING THE LIFE HISTORY OF THE WHEAT PLANT (after FRANCIS BAUER). With Explanatory Pamphlet by W. CARLUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet) 10s. per Set of Eight Diagrams.

THE POTATO DISEASE. By W. CARLUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

COTTAGE SANITATION

IN

RURAL DISTRICTS

BY

HECTOR MACLEAN WILSON, M.D., B.Sc.

WITH PREFACE

BY

T. PRIDGIN TEALE, F.R.S.

WITH TWELVE ILLUSTRATIONS

SECOND EDITION

Published by the
ROYAL AGRICULTURAL SOCIETY OF ENGLAND
13 HANOVER SQUARE, LONDON, W.

1896

FIFTH EDITION
(TWENTY-FIRST THOUSAND)

Elements of Agriculture

A TEXT-BOOK

PREPARED UNDER THE AUTHORITY OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

By W. FREAM, LL.D.

CONTENTS.

PART I.—THE SOIL.

1. ORIGIN AND PROPERTIES OF SOILS.
2. COMPOSITION AND CLASSIFICATION OF SOILS.
3. SOURCES OF LOSS AND OF GAIN TO SOILS.
4. MOISTURE IN SOILS.
5. IMPROVEMENT OF SOILS.
6. TILLAGE.
7. IMPLEMENTS FOR WORKING SOILS.
8. MANURES AND MANURING.

PART II.—THE PLANT.

9. SEEDS AND THEIR GERMINATION.
10. STRUCTURE AND FUNCTIONS OF PLANTS.
11. CULTIVATED PLANTS.
12. WEEDS.
13. SELECTION OF SEEDS.
14. IMPLEMENTS FOR SECURING CROPS.
15. GRASS LAND AND ITS MANAGEMENT.
16. FARM CROPS.
17. FUNGUS PESTS.
18. INSECT PESTS.

PART III.—THE ANIMAL.

19. STRUCTURE AND FUNCTIONS OF FARM ANIMALS.
20. COMPOSITION OF THE ANIMAL BODY.
21. FOODS AND FEEDING.
22. THE ART OF BREEDING.
23. HORSES: THEIR BREEDS, FEEDING, AND MANAGEMENT.
24. CATTLE: THEIR BREEDS, FEEDING, AND MANAGEMENT.
25. SHEEP: THEIR BREEDS, FEEDING, AND MANAGEMENT.
26. PIGS: THEIR BREEDS, FEEDING, AND MANAGEMENT.
27. THE FATTENING OF CATTLE, SHEEP, AND PIGS.
28. DAIRYING.
- INDEX OF PLANTS.
- GENERAL INDEX.

Of all Booksellers.

486 pages, with 256 Illustrations.

Price **THREE SHILLINGS AND SIXPENCE**, bound in cloth.

LONDON: JOHN MURRAY, ALBEMARLE STREET.

COTTAGE SANITATION

IN

RURAL DISTRICTS

BY

HECTOR MACLEAN WILSON, M.D., B.Sc.

WITH PREFACE

BY

T. PRIDGIN TEALE, F.R.S.

ILLUSTRATED

SECOND EDITION

Published by the
ROYAL AGRICULTURAL SOCIETY OF ENGLAND
13 HANOVER SQUARE, LONDON, W.

1896

FIRST EDITION :

REPRINTED FROM THE JOURNAL OF THE
ROYAL AGRICULTURAL SOCIETY OF ENGLAND,
Vol. III. Part IV. 3rd Ser. Dec. 31, 1892.
(24 pages ; Jan. 1893.)

SECOND EDITION :

REVISED AND ENLARGED.
(32 pages ; Aug. 1896.)

SUMMARY OF CONTENTS.

	PAGE
PREFACE TO THE FIRST AND SECOND EDITIONS, BY T. PRIDGIN TEALE, F.R.S.	5
SANITARY DEFECTS OF RURAL COTTAGES, WITH APPROPRIATE REMEDIES, UNDER THE HEADS OF:—	
I. THE SITUATION, CONSTRUCTION, AND CONDITION OF THE HOUSE ITSELF	7
The Exterior	7
The Interior	11
II. THE DISPOSAL OF HOUSE REFUSE	13
Slopwater	13
Excremental Matter	17
Dry Refuse	21
Refuse of Animals	22
III. THE WATER SUPPLY	23
Spring Water	23
Surface Water	23
Wells	24
Rainwater	27
Treatment of Impure Water	29
IV. THE HABITS OF THE INMATES	30
Inattention to Personal Cleanliness	30
Discomfort from Clothes-washing	30
Overcrowding	30.
Storage of Food	31
The Swill-tub	32
CONCLUSION	32



PREFACE TO THE FIRST EDITION.

THE following paper is the outcome of a meeting held on October 29, 1892.

Having been consulted on the question by Earl Cathcart, Chairman of the Journal Committee of the Royal Agricultural Society, I thought it best to take counsel with some gentlemen who are technically engaged at the present time in guiding sanitary work, rural and urban.

There met me at my house:—

MR. R. N. HARTLEY, Lecturer on Hygiene in the Yorkshire College, Leeds;

DR. SPOTTISWOODE CAMERON, Medical Officer of Health to the County Borough of Leeds;

DR. WHITELEGGE, Medical Officer of Health to the West Riding County Council;

DR. MITCHELL WILSON, Medical Officer of Health to the Doncaster Combined District;

MR. F. ATKINSON, Medical Officer of Health to the Craven Combined (Rural) District, and

MR. ERNEST CLARKE, Secretary to the Royal Agricultural Society.

After a long discussion of the various points that ought to be dealt with in such an essay, notes of which were taken by Mr. Clarke, it was arranged that Dr. H. Maclean Wilson should be invited to write a paper embodying the views agreed upon at the meeting, under the supervision of Dr. Cameron and myself. Dr. Wilson has been engaged for the last year with Dr. Cameron in the practical study of sanitary work in Leeds, having been previously for seven years in private practice in the rural district of Penrith.

The aim of the paper is to make suggestions of as simple a kind as will meet the necessity of each case, and to set forth a minimum of sanitary requirement such as may reasonably be attained in every country village.

Small towns and the larger villages have probably a sanitary machinery by which such improvements as are here suggested could be set a-going, but doubtless there are numbers of small villages in which there is a want of initiating power to secure, from those authorised to make it, a systematic house-to-house inspection of these elementary sanitary arrangements.

For these villages, might it not be possible to form small volunteer committees? Such a committee might be composed of a member of the squire's family, the clergyman, a nonconformist minister, the doctor, a tradesman, and one or two of the most intelligent cottagers. This committee, aided by the medical officer of health, could draw up a series of recommendations suited to the particular village, and then could visit every house and try to persuade each cottager to carry out the necessary rules and arrangements.

Committees of this kind would be of value in educating the members of the committee, in educating the villagers, in raising the standard of sanitary habits, and in bringing about a position of greater safety, should cholera or any other epidemic gain a footing in the country.

T. PRIDGIN TEALE.

LEEDS: *December 1892.*

PREFACE TO THE SECOND EDITION.

THE need for a new edition of "Cottage Sanitation" and the lapse of three and a half years since the publication of the original article in the Journal of the Royal Agricultural Society afford a fitting opportunity for the revision of what was then written and published somewhat under the pressure of a time limit, and for the introduction of such changes and improvements as further experience suggests. This new edition has been written by Dr. Maclean Wilson, with the aid and counsel of the same gentlemen who assisted him in the production of the original essay, and the pictorial diagrams have been drawn afresh by Mr. Michael A. Teale.

T. PRIDGIN TEALE.

LEEDS: *August 1896.*

COTTAGE SANITATION IN RURAL DISTRICTS.

SANITARY DEFECTS OF RURAL COTTAGES.

THE principal sanitary defects in the house of the agricultural labourer, regarded as a dwelling for a family, may be arranged under one or other of the four following heads:—

- I. THE SITUATION, CONSTRUCTION, AND CONDITION OF THE HOUSE ITSELF.
- II. THE MODE OF DISPOSAL OF HOUSE REFUSE.
- III. THE WATER SUPPLY.
- IV. THE HABITS OF THE INMATES.

Each head will be considered in detail, and for the commoner sanitary defects appropriate remedies will be described. It is scarcely necessary to say that in no case is it claimed that the remedy suggested for any evil is the only one, or even that it is always the best. The aim has been to make suggestions which may be found simple, effectual, and, above all, practicable.

I. THE SITUATION, CONSTRUCTION, AND CONDITION OF THE HOUSE ITSELF.

The sanitary defects under this heading may be divided into two groups—(a) defects of the exterior, almost all of which are such as lead to the dampness of the dwelling, and (b) defects of the interior.

(a) *Defects of the Exterior.*

Dampness of the dwelling is one of the commonest and most serious sanitary shortcomings of the country cottage. It may arise from one or more causes, some of which are exceedingly common in the older properties.

(1) **Unsuitable sites.**—Cottages are often built in most improper places. They stand, for instance, in damp hollows. They are built into excavated hillsides. They are erected on land undrained, perhaps waterlogged.

In fig. 1 an attempt has been made to represent a house built on porous soil. The soil is soaked with water, which percolates from higher ground above but cannot get away on account of an impervious layer below.

The soil is heaped up against the back wall of the house to a height of several feet above the floor level, so that both the floor and wall are kept continually damp. Too often this higher ground behind is the cottage garden, plentifully manured every spring; or, worse still, it is the site of the midden or pigsty. Hence it is by no means always pure water which causes the dampness.

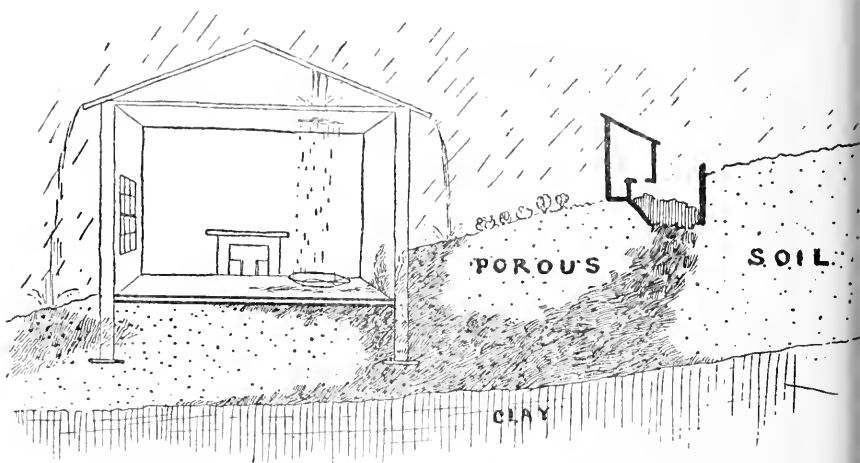


FIG. 1.—Cottage damp from leaking roof, unspouted eaves, want of damp-proof course, soil against outer wall wet with soakings from garden and privy midden.

Houses ought not to be built upon sites which have been “made” by depositing rubbish containing animal or vegetable refuse, at least until the lapse of many years.

(2) **The want of eave-spouting.**—In the same figure is shown what follows from the want of eave-spouting. The rain from the roof, running down the walls of the house or dropping from the eaves, soaks into the foundations and keeps the ground floor continually damp and unwholesome.

(3) **Leaking roofs.**—Very often, too, the roofs of the cottages are not watertight, and besides the immediate discomfort from the wet in rainy weather, there results a continuing danger from the dampness of the walls which have been soaked by the rain.

(4) **Ground damp.**—The walls may also be rendered damp by

the moisture which rises through them from the ground. This is especially the case in some of the older cottages where the interspaces of the walls have been filled up with earth, a practice which seems at one time to have been very common in some parts of the country. The use of sea sand in the mortar sometimes causes dampness. But even ordinary building materials are so porous as to suck up moisture from the ground very freely.

(5) **Pervious walls.**—The walls are sometimes made of very pervious material: sometimes they let the rain penetrate at the joints.

REMEDIES.—The remedies for these defects are enumerated in the same order.

(1) **For a damp site.**—A damp site should be well drained. An ordinary tiled drain, surrounded by rubble, should be laid all round the outside of the house, six inches at least beneath the floor level, and within a foot or two of the wall. In some cases this drain should be carried under the floor. The ends should be open to the air, covered simply by a grating. Where there is an ordinary house drain for sewage and slopwater, it should not communicate with this drain, which is intended only for subsoil water.

When the house is imbedded in the ground, all the soil alongside the wall should be taken away, down to a level at least six inches below that of the house floor. A free air space, a yard in width, should be left all round. The subsoil drain may be laid under this dry area, the surface of which should be paved, concreted, or asphalted, and sloped to a central channel so as to allow of the speedy removal of surface water.

In any case, indeed, it is well to have the surface of the ground immediately around the house paved, concreted, or asphalted, and sloped away from the house, so that rainwater may flow off without penetrating to the foundations.

The whole area within the house walls should be covered with some impervious material, and should be at least six inches above the level of the ground outside. Perhaps the best material is concrete, which may be made of Portland cement, one part; sharp sand, two parts; and hard stone chippings or broken brick, two parts. The concrete should be four inches thick, laid on six inches of dry rubble and rammed solid. If a layer of cement be floated on the surface, this may form the house floor. Pressed brick tiles, or hard paving stone, jointed with cement, may be preferred as a flooring material, but in such cases also six inches of rubble had better be laid as a foundation

for the floor, a thin layer of concrete being interposed to receive the pavement.

When a boarded floor is desired it should be laid above the foregoing impervious floor, and, to prevent dry rot, it is generally better to leave a space between the concrete and the boards freely communicating with the open air. This space, efficiently ventilated, is sometimes difficult to obtain, and Mr. Councillor Hamman, of Leeds, has suggested and carried out the plan shown in fig. 2, whereby a concrete surface can be boarded over.

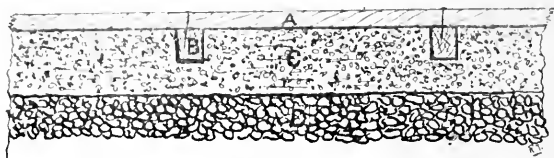


FIG. 2.—Concrete floor with boarded surface. A, floor boards; B, slips 2" \times 1½"; c, cement concrete 4" thick; D, rubble.

The ground is first prepared with rubble, on which is laid two inches of cement concrete. Wooden slips, 2 inches by 1½, are then laid about a foot apart, and the spaces between filled with cement concrete so as to make a level surface. To the slips the flooring is nailed.

(2) **For want of eave-spouting.**—The roof of the cottage should be provided with eave-spouting, with a fall-pipe to conduct the water either to a cistern or to a channel which will convey it away from the foundations of the house.

(3) **For a leaking roof.**—The roof should be made watertight. It is hardly within the scope of this paper to discuss the merits of the various methods of roofing. Thatched, tiled, and slated roofs may be all perfectly good if they are kept in repair. Thatch requires frequent renewal, and should never be allowed to get moss-grown or grass-covered. It also harbours vermin.

(4) **For ground damp.**—The only way of preventing the rise of ground damp in the walls is to provide a damp-proof course. This method is generally too costly to be applied to cottages already existing. A damp-proof course may, however, be inserted in the wall of a standing cottage, when it is a valuable one, by the method of "under-pinning." The measures available against damp sites are also of service against ground damp where a cure is impossible.

In new houses there should always be a damp-proof course, just below the floor level but above the level of the ground outside, in order to prevent the ground water from rising in the walls. There are several forms, and amongst the best is a

layer of asphalte or a double layer of impervious brick or slate, with alternating joints, set in cement.

(5) **Wet walls.**—Where rain penetrates the walls simply by beating against them, it can often be kept out by slating or boarding them, or by coating the outside with tar or paint or a layer of cement. Cement, rather than mortar, should also be used for pointing walls which are specially exposed to the weather. Such walls, too, may be partially protected by making the eaves overhang them rather more than usual.

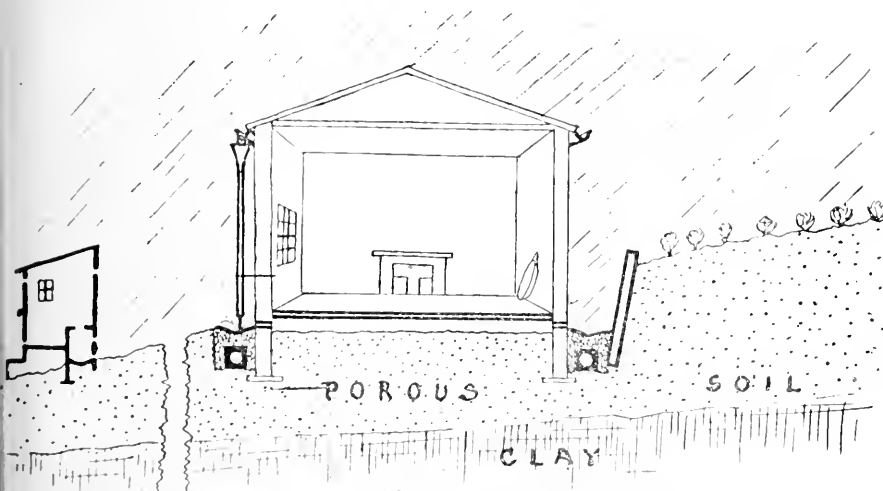


FIG. 3.—Remedies applied to cottage in fig. 1. Roof watertight and eaves spouted, dry area at back of house, subsoil drain surrounded by rubble laid alongside wall, floor concreted, damp-proof course inserted in walls, and privy reconstructed on lower site.

To line damp walls internally with wood is worse than useless. The boarding conceals the stain, and prevents the drying of the wall.

(b) Defects of the Interior.

The kitchen.—The cottage kitchen is the living room where all meals are taken, and where the family spend their evenings. It should, therefore, be the largest and most comfortable room in the house. The kitchen is often sacrificed to the policy of providing a small front “sitting” room, in which no one ever sits. It is far better to throw the two together, so as to secure a larger kitchen running the whole depth of the house, and lighted both from front and back.

The bedrooms.—Want of ventilation is very common in bed-

rooms. Windows are frequently made so that, with the exception of a single small pane, they cannot be opened. Even where there are sashed windows, one finds that the upper sashes are nailed, or fixed by neglect. The air in the upper part of the room can thus never be thoroughly renewed. Bedroom chimneys, especially where they are of the old-fashioned open kind, are often blocked up with straw or paper, so that they are rendered useless for ventilating the rooms.

Attic bedrooms are often met with, only seven or eight feet high under the ridge of the roof, and but two or three feet at the sides. They are generally badly lighted and ill ventilated. Often they have only one small window about two feet square close to the floor.

Care should be taken that all windows can be widely opened. It is of great importance that the opening should extend as near to the top of the room as possible. A good way of ventilating a bedroom is to set, in the walls under the bed and again near the ceiling, one or two of Ellison's perforated bricks. These have conical perforations—the wider openings internally—so that the air entering by them creates no draughts.

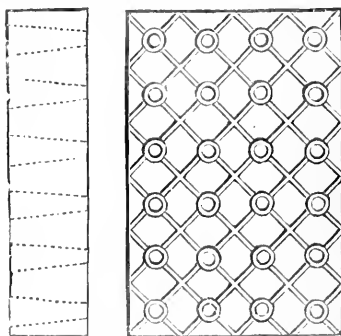


FIG. 4.—Ellison's bricks.¹

Where there is a sashed window, a simple plan is to raise the lower sash a couple of inches and fit under it a piece of thick board, so as to close the opening entirely. Air can then enter between the two sashes and is directed upwards, so that no objectionable draught is caused.

In the case of an attic, a skylight which can be opened, or some other means of ventilation, should be inserted near the highest part of the room.

There should be at least one bedroom with a fireplace in

¹ The manufacturer is Mr. J. E. Ellison, 2 Oxford Place, Leeds.

every cottage. The fireplace may never be used in ordinary circumstances, but becomes a necessity in case of illness in winter, and at all times it helps ventilation. The chimney ought always to be kept open. One of too large an aperture may have a board fitted in, with a hole a foot square in the centre of it.

All bedrooms should be ceiled. Otherwise the extremes of cold and heat render them at times almost uninhabitable.

II. THE DISPOSAL OF HOUSE REFUSE.

House refuse may be divided into three kinds: **slopwater**, **excremental matter**, and **dry refuse**. These are sometimes disposed of separately, sometimes thrown together into a privy midden. They are produced in every household, and, in the absence of proper means of disposal, each kind may give rise to nuisance. In some cases **refuse of animals** has also to be disposed of.

(a) *Slopwater.*

One of the commonest sanitary defects in cottages is the want of a proper method of disposal of slopwater.

(1) **Houses without drains.**—Slops are often thrown at random on the ground close by the house door or into an open ditch dug in the soft soil. In such cases a hole is before long formed, which remains always full of foul and fermenting sewage. The soil too becomes saturated with sewage. Often the slopwater is thrown on the top of the privy midden, causing a similar nuisance. In not a few cases it is got rid of by throwing it into a stream or watercourse.

(2) **Defective drains.**—Even where a house drain has been laid, grave nuisance is often caused by its faulty construction. Drains which are formed of rough stone or porous brick, of field drain-pipes, or even of socketed pipes if they are improperly jointed, allow the liquid part of the sewage to escape from them at every crevice, the sludge being left to block the drain and decompose. All flat bottomed drains are objectionable.

(3) **Defective gulleys.**—The gully on the house drain often causes nuisance because of its defective construction. It is often in the form of a small cesspit, sometimes with a defective iron trap on the top, sometimes with no attempt at trapping. Such gulleys retain a large quantity of sewage and of sludge which necessarily becomes putrid. All untrapped gulleys permit the escape of effluvia from the drain.

(4) **Untrapped sink waste-pipes.**—When a cottage has a

slopstone or sink it is not uncommon to find the waste-pipe directly connected with the drain, without any trap to prevent foul air from being drawn from the drain into the house.

(5) **Defective disposal of sewage.**—The proper disposal of the sewage at the outfall of the house drain is very usually neglected. Generally the drain discharges into the nearest watercourse, which may perhaps be the source of water supply for dwellings lower down. When the discharge is on to a field the sewage, instead of being properly distributed, is frequently allowed to collect in stagnant pools, which become very offensive in warm weather.

(6) **Badly constructed cesspools.**—When a cesspool is used, it is very commonly built so as to be quite pervious to water, so that the liquid part of the sewage percolates into the soil, or, as often is the case, into a well or cellar. Ventilation is generally neglected, and the sludge in the cesspool is frequently left untouched for months or even years.

REMEDIES.—The following suggestions refer to these defects in the same order.

There should always be provision for the immediate removal of dirty water from the neighbourhood of the dwelling.

(1) **Houses without drains.**—Where a large garden with porous soil is available, slopwater may easily be disposed of without nuisance by utilising it for watering. In practice, however, it is found that instead of carrying out such a system properly the cottager persists in throwing the slopwater in one spot, generally close by the house door. It is therefore nearly always best to lay a drain as directed below.

(2) **The house drain.**—The drain should be of glazed socketed pipes, four inches in diameter, jointed with cement. Care must be taken to lay the drain with a regular and sufficient fall; if possible, never less than one foot in forty. It ought also to be at a depth of not less than two feet, so that it may not be injured by traffic or by gardening operations. Wherever the drain takes a sudden bend an inspection-pipe must be inserted at the bend, and in such a situation that it can be easily got at in case of stoppage. A slightly greater fall should be given to the pipes before and at the bend. Elsewhere the drain should be laid in straight lines. When the drain joins a cesspool or a sewer, a Buchan trap, or similar disconnection must be inserted in its course, and a ventilating shaft, four inches in diameter, erected at or near the highest point of the drain, terminating at a distance from all windows and chimney tops.

Where several cottages are drained in common, an intercept-

ing or disconnecting chamber may be built. Into this each house drain should run separately, so that if a block occurs in any one drain it can at once be discovered and easily remedied. From the trapped end of the chamber a single drain takes all the sewage.

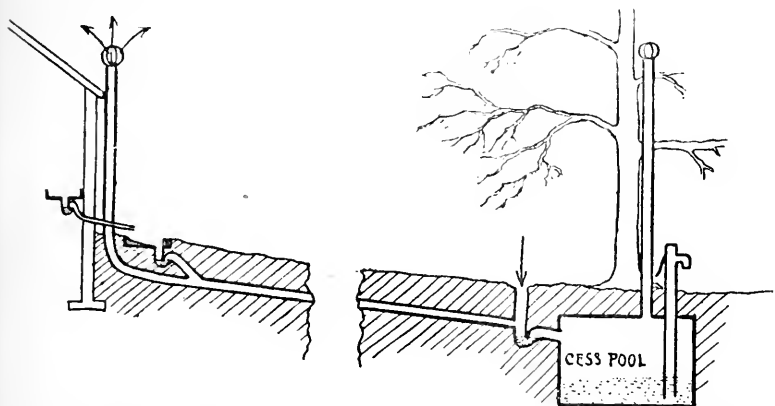


FIG. 5.—House drain discharging into a cesspool from which it is disconnected by a Buchan trap. The upper end of the drain is provided with a ventilating shaft. A trapped sink waste-pipe discharges over the dish-tone of a gully. The cesspool is ventilated and has a pump by which it can be emptied.

(3) The gully should not be of too great capacity, but should have a fairly large opening. One of six inches diameter is perhaps best for general use. It should be set on a level base so that it may not readily be displaced. It should have a

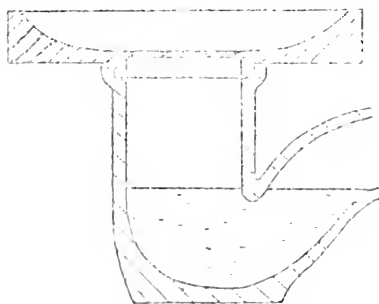


FIG. 6.—An ordinary earthenware gully.

water seal of at least two inches to prevent gases from the drain from getting out near the dwelling. A dishstone should be provided, with an opening as large as that of the gully, and protected by a hinged galvanised iron grid of wide apertures.

The dishstone ought to fit into the gully just as one drain-pipe fits into the socket of the next, so that the whole arrangement, from the dishstone to the outlet of the drain, forms one smooth impervious tube. The gully should never be set, as it often is, in unpaved ground, but should have round it, for a distance of at least a yard in every direction, a smoothly paved or concreted surface falling slightly towards the dishstone.

(4) **The sink.**—It is a question for discussion whether sinks (or slopstones) should be provided for cottages. Probably a sink should be provided only where there is a tap above it with a copious supply of water. Where there is a sink it should not be placed in the kitchen living room, but in a small back

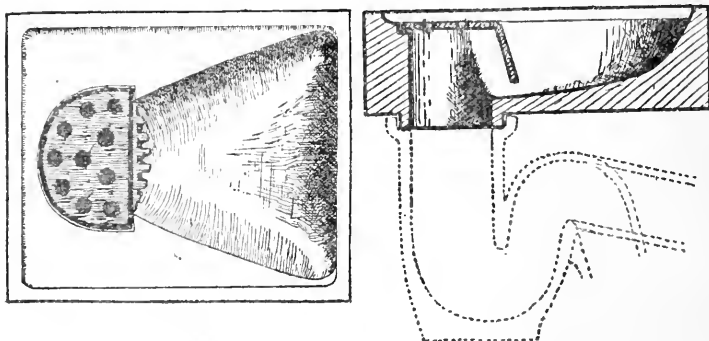


FIG. 7.—Dishstone for yard gully, specially formed to receive sink waste-pipe.

kitchen or half-covered yard. In the back kitchen it should be set against the outer wall, so that the waste-pipe leading from it, trapped with an S bend, may be led directly through the wall to the outside of the house. There the pipe should be cut off, and made to deliver in the open air over a channel leading to the yard gully. In this case the dishstone of the gully may be of a special shape, with a channel into which the waste-pipe discharges, as shown in fig. 7.

(5) **Disposal of sewage.**—The best method of disposing of sewage is to run it on to land, distributing it over a large surface by a shallow ditch, the course of which is changed from time to time so that the soil does not become saturated.

(6) **Cesspools.**—In some cases where it is impossible to run the sewage directly on land for irrigation, it may be necessary to construct a cesspool, but this should always be avoided where possible. When a cesspool is necessary it ought to be very carefully built of hard blue brick set in cement, or of concrete, with a foundation and backing of puddled clay, so as to be

perfectly watertight. It should be covered over and well ventilated, and be provided with a pump for the easy removal of the sewage (fig. 5). Such an arrangement is often seen in farm-yards, where the liquids draining from cowsheds, stables, and piggeries, are received in an underground tank, and from time to time are carted away for distribution on the fields. Similarly, the contents of a cesspool from a house drain should be used on garden ground or on the fields. No overflow drain from the cesspool should be allowed.

The site of a cesspool requires to be carefully chosen, and should be at as great a distance from dwellings and from sources of water supply as possible—never nearer than 100 feet.

(b) Excremental Matter.

The closet attached to a country cottage in the northern counties is generally a midden privy. In the south and mid-lands it is more often a vault privy (or cesspit closet). Both are usually found to be constructed, at least in all the older properties, in defiance of all principles of health.

In almost every country district, closets may be found built against the walls of dwellings. In most of these cases the midden or cesspit leaks, and the liquid from it soaks into the foundation of the house. In villages the closets are occasionally so placed that the middens or cesspits can only be emptied by carrying the filth through the dwellings. Lighting and ventilation are usually neglected. The closet floor is often of loose wooden planks, or even of hardened earth, easily soaked with filth, incapable of being cleansed thoroughly, and frequently in addition sunk beneath the ground, so that it is liable to be flooded with surface water, or with liquids draining from the receptacle.

As for the receptacle, whether midden or cesspit, it is commonly built of ordinary stone, or brick and mortar, sometimes of wood. Often, indeed, the only receptacle is a hole dug in the soil at the back of the closet, or even this may be wanting, and the closet may be found placed over a stream or ditch. The receptacle is often of huge size; the floor sunk beneath the level of the ground, and unpaved, so that surface and subsoil water both get in; and frequently there is no covering to keep out rain. By way of obviating some of these defects the receptacle is often connected with the house drains—a practice which not only leads to the blocking of the drain with fine ashes or filth, or to the escape of foul gases into the closet from the drain (for these drains from the receptacles are very

rarely trapped), but which also has the disadvantage of fouling the drain with extremely offensive and decomposing sludge. In very many cases the scavenger must get inside the receptacle before he can remove the contents.

As regards **scavenging**, the old idea was that the receptacle should be large enough to require emptying only once a twelve-month, when the contents are required for the cottage garden. This plan is full of danger, for such accumulations form a fruitful soil for the growth of disease germs. The danger is greater where one receptacle serves for two or more closets, or where persons from different families use the same closet, as, for instance, at schools.

The chief points to be attended to in building a closet with **fixed receptacle** may be found well laid down in the "Model Byelaws of the Local Government Board with respect to New Streets and Buildings" (Eyre & Spottiswoode, price 6*d.*). They are epitomized as follows:—

The closet should be twenty feet or more from the dwelling, should be in such a position that it can be conveniently cleansed, should be ventilated (and lighted), and should have an impervious floor raised above the level of the ground. It must not be near any source of water supply.

The fixed receptacle should be of non-absorbent materials, perfectly watertight, and protected from rain and surface water. It should be well ventilated, should have the floor raised above the level of the adjoining ground, and must not communicate with any drain. It should be so constructed that the scavenger need not get inside in order to remove the contents.

The size of the receptacle should be moderate, so as to necessitate scavenging at least once a month. One of twenty cubic feet capacity is quite large enough, even where dry house refuse is thrown in. School closets should be scavenged at least once a week. In compact villages, too, all closet receptacles should be emptied at least once a week; in sparsely inhabited rural districts once a month may suffice.

Ash closet.—Of all the varieties of closets with fixed receptacles one of the best is that of which a figure is given. This form is becoming common in the northern counties, being recommended, for instance, by the Durham County Council, on the advice of their medical officer, Dr. Eustace Hill. Where a cubic space of twenty feet is desired, it may be gained by raising the seat, another step being inserted.

The advantages of such a closet are fairly obvious. The contents are kept as dry as possible, any leakage shows itself at once, the dry refuse (thrown in when the seat is raised) is

deposited directly on the night soil, no great accumulation can occur, and the receptacle can be emptied with ease into a barrow or cart by a man standing outside.

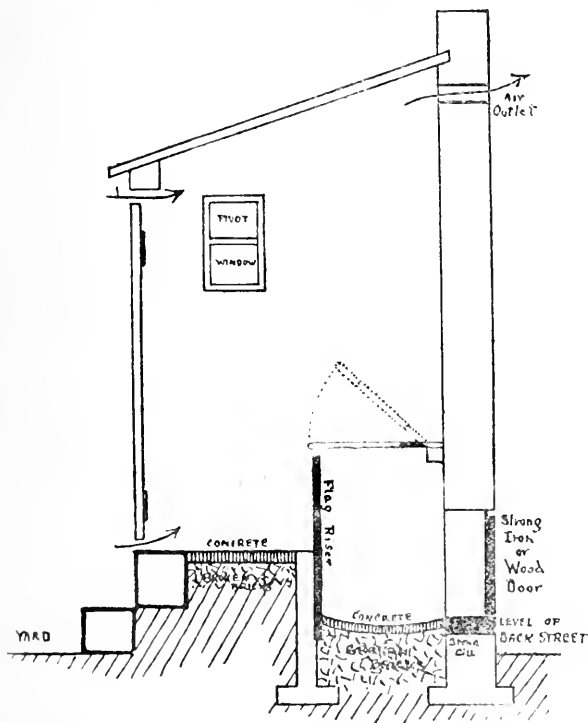


FIG. 8.—Ash closet.

A **pail closet**, or closet with movable receptacle, is probably the best arrangement in the country, where a cottage has a good-sized garden on which to dispose of the contents of the pail.

The closet is constructed like that of the privy already described (see also the "Model Byelaws"); but instead of providing a fixed receptacle, a pail is slipped under the seat. The seat is hinged and rests on two side supports or brackets, and the pail is slipped in from the front. There should be no "riser" or upright piece of wood in front of the pail, so that anything spilled on the floor can at once be seen and easily removed. To avoid spilling, the pail should be of such a size as to come nearly, but not quite, up to the under surface of the wooden seat.

Well made and strong cylindrical pails of galvanized

iron of a capacity of two cubic feet can be had for about five shillings, and are found to last for years with ordinary usage. Wooden pails, when strongly made and well-tarred inside, are very durable. Two good pails can be made from a paraffin cask by sawing it across the middle. It is important that a strong and well-made pail be used in the closet, for nuisance is often caused by the use of makeshift and flimsy wooden boxes or cheap galvanized iron pails. The pails should be emptied *and cleansed* at least once a week, and it is well to coat them internally with tar from time to time.

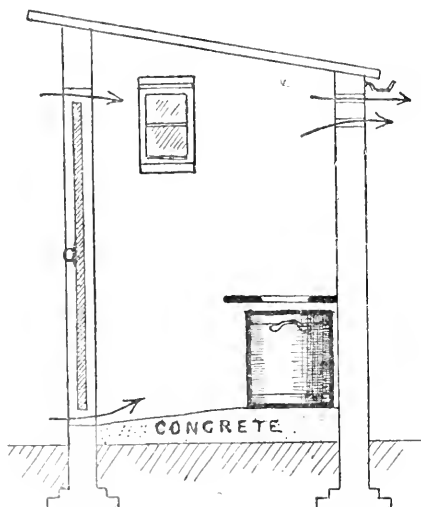


FIG. 9.—Pail closet, with movable receptacle.

The use of dry earth.—In the privy midden or pail closet it is of great advantage to use dry earth, converting it in fact into an earth closet. The earth is taken from any garden or field, in as dry a state as possible, and placed in a box in the privy. With a trowel or scoop about two pounds are thrown into the privy by every person using it. This soaks up all liquid and acts as a deodoriser. Crushed peat, sawdust, and ashes are also used for this purpose, but none of them has the absorbent and deodorising power of well dried garden soil. To insure dryness, which is essential, a quantity of soil should be secured in dry weather and stored under cover. Slopwater should never be thrown into a closet receptacle, so that the liquids to be absorbed may be as small in quantity as possible.

To improve existing closets is generally no difficult matter.

The closet can usually be much improved by raising the floor and concreting or paving it, and by securing ventilation through "pigeon holes" in the walls and through spaces made by cutting a couple of inches off the top and bottom of the door. A privy midden or closet cesspit can be filled up to a level slightly above that of the adjoining ground, and made watertight by lining it with concrete or other impervious material, and rain-proof by providing a suitable covering. Ventilation can be secured by providing "pigeon holes" or other openings in the walls and running a shaft of six-inch glazed earthenware pipe up through the roof. It is generally easy to do away with the old receptacle and to convert to a pail closet.

But these remedial measures should only be undertaken when the closet is of substantial construction. It will generally be better to demolish and build anew.

(c) Dry Refuse.

Dry refuse should consist almost entirely of ashes and dust, but very commonly along with these the housewife throws away fragments of food, parings and shreds of vegetables, bones, and rags. Slopwater, too, is often thrown upon the refuse heap, and the whole collection is frequently allowed to accumulate for months or even for years. The site of the refuse heap is generally somewhere near the cottage door, often against the wall of the dwelling, or close by the well. Thus, even where the dry refuse is disposed of separately from night soil, the resulting nuisance may be quite as serious as in the case of the worst closets.

Every kind of refuse that has any food value should go to feed the cottager's pig or fowls, and everything else that will burn should be burned at the back of the kitchen fire. There will always be such refuse as broken crockery, old tins, &c., to be got rid of, but such things can be stored in a corner for a time without causing nuisance. Probably the best way of finally disposing of them is to bury them deeply in the ground. If this is done the dry refuse remaining is best disposed of in the closet receptacle, and for this purpose the finer it is the better.

A simple plan of separating ashes from cinders is to set a sieve or riddle on the top of an eighteen gallon cask or flour barrel, on the bottom of which rockers like those of a cradle are fixed. When the mixed ashes and cinders are thrown into the riddle a slight shake of the barrel will thoroughly separate the ashes, and the cinders can be used again for fuel.

Another good plan is to have an ash-hole under the kitchen

hearth, covered by an iron grid. The ashes are raked over the grid each morning, and all the finer part falls into the pit, the cinders being put back into the fire. Such an ash-hole is usually some 2 feet by $1\frac{1}{2}$, and 1 foot in depth—large enough to contain the ashes of the kitchen fire for a week.

Dry ash-pits.—Sometimes a separate receptacle for dry refuse is required. Such an ash-pit should be constructed on the same principles as the fixed receptacle of the privy midden or ash closet (see “Model Byelaws”). On no account should slops of any kind be emptied into an ash-pit.

The final disposal of the contents of closet receptacles and ash-pits is generally an easy matter in the country, where nearly every cottage has a garden close at hand. It is sufficient for purposes of health to carry the refuse to some distance from the house and bury it in the ground under an inch or two of soil. Care, however, must be taken so to dispose of it as not to pollute any water supply. In more compact village communities it would be well if the District Council took charge of the removal of refuse.

(d) Refuse of Animals.

The way in which the cottager's cow or pig is kept often causes a nuisance. Frequently the cowhouse or pigsty is placed

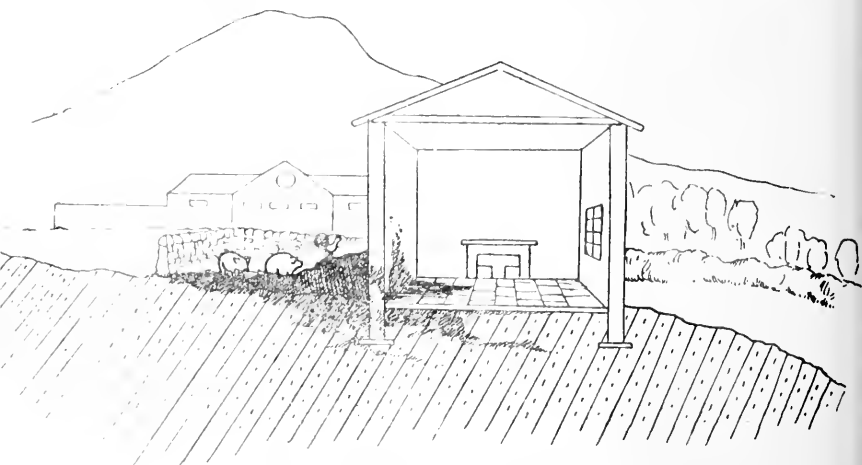


FIG. 10.—Pigsty against wall of dwelling.

against the house wall, with a floor of rough stones or simply of hardened earth, so that the liquid filth soaks through into the foundations.

These buildings ought to be at a distance from the dwelling (the greater the better, and never less than 20 feet), and should have a floor of impervious material so laid that all liquids drain away at once into a covered, but disconnected, cesspool, or directly on to the land. The floor may be formed of hard bricks jointed with cement. The drain and cesspool should be constructed as already directed in the case of a house drain and cesspool.

A manure heap ought to be on a site constructed like that of the privy midden if it is near the cottage, or if there is a well anywhere near. But it is better to carry the manure directly from the cowhouse or pigsty to a distance, and place it where the liquids draining from it cannot be injurious, covering it with an inch or two of soil to protect from waste and to prevent nuisance.

Especial care must be taken not to allow the liquids from any of these middens, pigsties, or cowhouses, to flow into a watercourse or pond, or to soak into pervious soil from which any water supply is drawn.

III. THE WATER SUPPLY.

This may be from one of four sources. Water is either (1) caught from springs as they issue; is taken (2) from gatherings of surface water, such as a pond, ditch, or watercourse; (3) from a well; or (4) from a rainwater cistern.

(1) **Spring water.**—Springs give some of the best water supplies for country villages. Generally the water is somewhat hard, but, as it issues at least, free from all animal and vegetable contaminations. Springs which dry up in summer should be regarded with suspicion. The water they yield comes from no great depth, and may have all the objectionable qualities of surface water, or of that from shallow wells, to be presently pointed out. Some springs, moreover, are only formed by the reappearance of a stream which has for a little distance followed an underground channel. The water may have been polluted at some previous point in its course. This is more likely to happen in limestone districts.

It is but rarely that any precautions are taken to prevent pollution of the water of a spring before it can be collected. It would generally be easy to build round the spring a small covered tank of impervious bricks and cement so as to collect all the water, which could then be allowed to issue by a spout, or could, if necessary, be piped to any more convenient place.

(2) **Surface water.**—Many cottages in the country are supplied

by surface water. This may be very good, as when it comes from uncultivated grasslands or moors or rocky land. Many of the larger water supplies are from such sources.

On the other hand, surface water is always unsafe when it drains from arable land which is often and heavily manured, or when it is liable to contamination from roadways, dwellings, or farm buildings. In the use of water thus polluted there is always a risk, as it may at any time contain the germs of infectious disease. A purer supply should therefore be substituted. Surface water from a pond is sometimes, though fortunately very rarely, the only available supply. In such a case the pond should be protected from cattle and ducks, and should be thoroughly cleansed from mud every year. The water may be improved in quality by leading it through a filter bed into a well, from which it can be raised by a pump.

(3) **Well water** may be amongst the best or the worst of water supplies.

Shallow wells, in the subsoil, are liable to all the impurities of surface waters. The waters come actually from the same source, and are only partly filtered by passing through a few feet of porous soil. This apparent purification perhaps only renders them more dangerous, as it produces a feeling of false security in their use.

Deep wells, which penetrate the strata under the subsoil, yield water like that of springs—pure, but generally rather hard. When such a well is sunk through a porous subsoil into an underlying water-bearing rock it is liable, like the shallow well, to contain surface water only partially filtered through the subsoil. The best form of deep well is one whose shaft pierces an impervious stratum to reach the stratum in which the water is stored. In this case the water has entered the soil at the outcrop of the water-bearing stratum, often at a very great distance from the site of the well, and may thus have been very thoroughly filtered.

The construction of wells is usually carried out on very unscientific principles. From this point of view wells may be divided into Dip-wells, Draw-wells, and Pump-wells.

Dip-wells and *draw-wells* differ only in depth. In the former the water comes so near the surface that it can be ladled out, in the latter the well is so deep that the water must be drawn out by a bucket attached to a rope. Both are open or only protected by a movable lid, and are therefore liable to become polluted by dust, dead leaves, slugs, and insects. It is very common to find a dead frog, or worm, or even a dead mouse or rat in such a well. A dip-well is generally approached by

one or two descending steps, and usually there is nothing to prevent surface water and mud from gaining access in wet weather.

These wells are often polluted by the use of dirty buckets for drawing water. This is a frequent source of complaint where one well is used by a number of cottagers.

Pump-wells are very often exposed to pollutions from the surface. They are frequently covered with loosely fitting planks or paving stones, and through the chinks surface water and mud can freely penetrate. When a pump is allowed to get out of order, dirty water is often used by the cottagers "to make the water come," or to prime the pump, and thus the well may be grossly polluted. In some cases where an iron pipe is used for the pump and the water is one which dissolves iron freely, the water may become so impregnated with iron as to be objectionable.

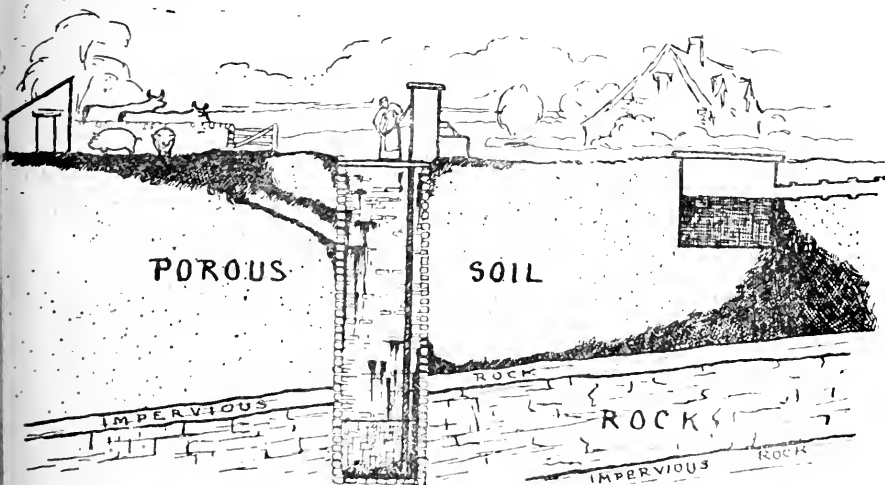


FIG. 11.—Deep well, polluted by entrance of surface water, by soakage through the subsoil from a neighbouring pig-sty, and by percolation from a more distant cesspool.

Wells of all three kinds are often liable to pollution because of the imperfect construction of the shaft, which is very frequently walled with dry stone or brick, and is freely pervious to subsoil water. In examining such a well, stains are usually evident on the sides of the shaft where muddy water has run down in wet weather, and there is usually a deposit of mud on the bottom.

A very common defect in connection with all kinds of wells is the want of some provision for carrying off water which has been used for swilling out buckets, or which has been spilled in

drawing. Very often this waste water is left to find its way back into the well, carrying mud and other polluting matter with it.

The sites chosen for wells are often such as inevitably lead to pollution of the water. Wells are found within a few feet of leaking drains, cesspits, pigsties, etc. In farmyards they are often found close by the manure heaps. In such cases, liquid filth may not find a way directly into the well, although it often does, but in wet weather the liquids draining from these sources of pollution soak into the soil, and thence into the well. In many country villages all the wells have become polluted through this pollution of the soil round them.

Proper construction of a well.—The shaft of a well ought to be constructed, at least for ten or twelve feet near the top (or down to the rock, if the well is sunk in rock) of impervious materials, such as hard blue brick laid in cement, or concrete, with a backing of at least six inches of puddled clay. When the well is sunk through a layer of clay or other impervious stratum, the shaft should be made thoroughly watertight down to the impervious stratum. Then no water can enter from the upper layers of the soil.¹

Draw-wells and dip-wells should be covered over and provided with a pump. If this course is not taken, then the shaft walling should be continued for a foot or so above the level of the ground, with a coping on the top. The opening should be protected with a close-fitting lid. A special bucket for drawing the water should always be provided at the well.

In the case of a pump-well, the top of the shaft should be covered with a flagstone, the shaft if necessary being narrowed in the upper part to receive it. The flagstone should be a couple of feet underground, and protected by a foot of puddled clay. For a considerable area over and around the site of the well the ground should be grass grown, and no manure should be used. It is better to have the pump set at a distance from the well. The pump may, for instance, be placed in a back kitchen or by the roadside, the well being in an adjoining field.

In every instance a suitable drain should be laid to carry off all waste water from the neighbourhood of the well.

Artesian Wells.—Sometimes where a group of cottages is to be supplied with water the best plan is to bore an Artesian well. This is a deep well, formed by boring through some impervious

¹ Dr. Poore has used (vide *Lancet*, December 14, 1895) large glazed earthenware pipes, jointed in cement. Such pipes can be had up to three and a half feet in diameter, with the flanges inside to facilitate sinking. They have been used for many years by Mr. Tudor, Sanitary Inspector of Goole.

stratum into one which is full of water. The water is generally hard, but free from organic impurity.

Bore-wells of another kind are sometimes sunk to tap a water-bearing stratum near the surface of the ground.

In both cases the bore needs to be protected from the entrance of surface and subsoil water. This is generally done by lining it with an iron tube for twenty feet or so. The tube may be prolonged a foot above ground and the pump—where that is necessary—attached directly to it.

Improvement of existing wells.—These directions may suffice to point out what can be done to improve existing wells. The aim is to ensure that there shall be no direct admission of water from the surface or from the upper layers of the soil.

No amount of care will render permanently secure a well which has near it a closet, cesspool, pigsty, or midden. None of these, even when constructed as has been suggested, should ever be allowed within 50 feet of a well, and the cesspit not within 100 feet. In fact, where the soil is porous, liquid filth escaping from any of these sources may find its way into a well even from greater distances than these. When a house drain passes near a well, great care must be taken to make the drain watertight at the joints. The best plan in such a case is to imbed the drain in concrete.

(4) **Rainwater.**—In many parts of the country where the soil is porous to a great depth, or where well water is brackish or excessively hard, there is no good water supply available except that from rain. At a distance from towns this is of great purity. The average amount that falls on the roof of a medium-sized cottage is upwards of 4,000 gallons a year, of which, perhaps, 3,000 gallons might be collected and stored. This quantity is sufficient for drinking and cooking purposes for a small family. Unfortunately the methods used for collecting and storing make the water in many cases both distasteful and dangerous.

Collection.—The roofs of the houses are allowed to get coated with mosses, soot, bird droppings, and dead leaves, and the gutters are so laid as to let the water become stagnant in them.

Rainwater, when intended for household purposes, should be collected from a tiled or slated roof by properly laid iron gutters. It is well to allow the water to run through a strainer of copper wire gauze, so as to keep back straws, dead leaves, &c. Dr. Mitchell Wilson, of Doncaster, finds a box with a perforated zinc bottom, containing sand and gravel, useful for this

purpose. Roberts's "Roof Washing Tank"¹ catches, and runs to waste, the water which first comes off the roof in any shower, and then allows the rest to pass on into the cistern. In this way the roof and gutters are washed before the water is collected from them.

Storage.—The cistern in which the water is stored, which should be of some impervious and easily cleaned material, is very frequently an uncovered wooden tub of uncertain age, coated with soot and vegetable growths. In the Eastern Counties it is commonly an underground tank, built of ordinary brick and mortar only four and a half inches thick and plastered inside with cement. A tank of this construction soon gives way and admits subsoil water, which in many cases is grossly polluted by the liquids percolating from neighbouring leaky cesspits or from pigsties.

These tanks, too, are commonly used as draw-wells, and the openings being on a level with the surface of the ground and inefficiently protected, the water is polluted by dust, surface water, slugs, and insects.

The cistern should be raised above ground on brick or stone supports, should be constructed of hard blue brick set in cement, or of concrete, and coated internally with cement, or it may be made of flagstone or slate or galvanized iron, never of lead. A tightly fitting cover should be provided, but such as can be easily removed to allow the tank to be cleaned. A pipe, protected at the outer end by wire gauze, should be placed near the top of the cistern to serve as ventilator and overflow. A tap may be inserted in the wall of the cistern itself, a few inches above the bottom, or a pipe may be laid from the cistern to a tap in the house. A plughole for cleansing should be provided in the bottom, and the walls and floor of the tank should be thoroughly scrubbed at least once a year.

It must be borne in mind that lead pipes are dangerous when used for conveying rain water, the lead being dissolved easily in poisonous quantities. Perhaps pipes of wrought-iron coated with Angus Smith's solution are the best.

When an underground tank is desired, it must be constructed in some situation sufficiently removed from any such source of contamination as a cesspit, pigsty, or midden, just as if it were a well. The walls and floor should be of concrete or of hard brick laid in cement, and plastered internally with cement, should be nine inches thick, and should have a foundation and backing of at least six inches of puddled clay. The tank should

¹ C. G. Roberts, Haslemere, Surrey. Price 15s. to 20s.

be covered over with a brick or concrete arch, an opening, however, being left to allow of entrance for cleansing; and a pump, either alongside, or, better still, at some little distance, should be provided.

Treatment of Impure Water.

In judging of the purity of water the appearance, is a very poor guide; for a water which is grossly and dangerously contaminated may be bright and sparkling. The surroundings of the source of supply are much more significant—a better guide in many cases than a chemical analysis of the water.

There is always danger in the use of impure water. A wholesome supply should in every instance be provided. When for any reason impure water must be used, care must be taken to boil the water for ten minutes before using it for drinking or for cooking, or for washing.

Filters.—No reliance should be placed on the use of filters for purifying water which has been dangerously polluted. Of all the filters in the market only one or two are capable of removing disease germs, and these are not permanently reliable in unskilled hands. Filters of nearly every kind are actually found to increase the number of living germs in the water which passes through them, for the filtering material acts as a breeding ground. Filters, however, are useful for removing suspended matter from water so as to make it clear and palatable.

One of the cheapest and simplest filters for cottage use is composed of a block of charcoal in the bottom of a glass funnel, the water having to pass through a considerable thickness of the charcoal before issuing. The charcoal block can easily be taken out, scrubbed, and roasted in a hot oven, and is again ready for use.

Another simple filter can be made as follows. Take an ordinary flower-pot of twelve inches in height, and in the bottom put a layer of clean gravel, then one of finer gravel and sand, a layer of animal charcoal, and another layer of sand, each about one-and-a-half inch in depth. The water is poured in at the top and filters out at the bottom. Such a filter should be renewed every month, and if the charcoal is strongly heated it is purified and can be used again.

A very simple and efficient filter can be made (fig. 12) by any handy cottager out of a block of porous sandstone. Dr. Mitchell Wilson describes it thus, as used in his district. "A block of sandstone, circular in section, about a foot in diameter, and a foot and a half in depth, and slightly tapering towards the

bottom, is hollowed out so as to leave a thickness of stone of two-and-a-half to three inches. This contrivance is of considerable weight, and is supported on a wooden stand. Under it a dish is placed to catch the filtered water. It can be readily cleaned by rubbing with a piece of similar sandstone or a hard brush."

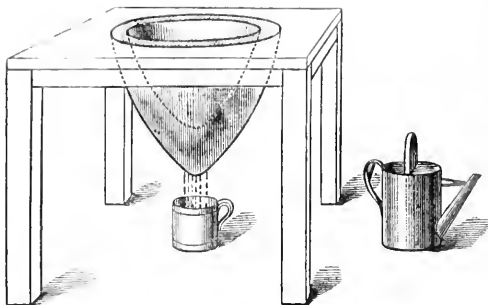


FIG. 12.—Sandstone filter.

IV. THE HABITS OF THE INMATES.

These are much more difficult to alter than the structure of the cottages. They are, however, closely connected with the surroundings of the cottager in his home.

Inattention to personal cleanliness.—Although the English, of all nations, are amongst the most attentive to personal cleanliness, there is yet often room for improvement. Washing is sometimes rendered difficult by the scantiness of water, or by the labour required in carrying it from a distance.

There is seldom any convenient arrangement for personal washing, and it is, as country doctors know, the next thing to an impossibility for a cottager to have a warm bath. The Saturday night's tub for the children is fortunately an established institution. In villages, and especially in mining districts, the provision of public baths would be a great boon.

Discomfort from clothes-washing.—The discomfort where washing has to be done in the living room is very great. The practice is in some cases not without danger to health. The washing may be done in the open air in fine weather, but each cottage should have a wash-kitchen, provided with a boiler or set-pot. The sink, or slopstone, when there is one, should be placed in this wash-kitchen, so that no washing, whether of clothes or of dishes, need be carried on in the living room.

Overcrowding is too common in rural cottages, and leads to

much injury to health and to morals. How to deal with it is often a very difficult question—where, for instance, a labourer has a large family and a small cottage, and no other dwelling is available near his work. Cases of overcrowding where lodgers are taken in, or where adults of both sexes (not man and wife) sleep in one room should always be reported to the sanitary authority, and no considerations should stand in the way of dealing with such cases.

Where there are ordinary doors, windows and fireplace, 300 cubic feet of space should be allowed for each grown person, no height greater than 13 feet being taken into account in the computation of cubic space. Thus, a bedroom with fireplace, window and door, the dimensions of which are 15 feet by 12, and 9 feet high, would furnish this minimum air-space for five grown persons and a child; while one 12 feet long by 6 feet broad and 9 feet high would give this minimum air-space for a man and his wife. Long before morning, however, in either case the air of the room would have been charged with breath products, and be offensive to the sense of smell. It is much better to have at least twice this minimum of air-space, and whatever the size of the room free ventilation is necessary. In every room, moreover, the air should be thoroughly renewed daily by keeping doors and windows open for a time.

Where house accommodation is scarce, a District Council can take steps, under the Housing of the Working Classes Act, to provide cottages for labourers and their families. This power is seldom exercised. It might often be used with great advantage.

Storage of food.—The proper storage of food is very little attended to. Food is kept as a rule in a cupboard in the living room, or in a damp and unwholesome cellar. Milk is especially liable to take up the germs of infectious disease. In many cases where the cottager has a cow, the milk is stored in places where it can receive emanations from middens, pigsties, and cow-houses.

Alongside the back kitchen a good pantry, and, where a cow is kept, a dairy, should be provided. Such a building should be floored with concrete, or with stone or hard tiles set in cement, should have stone shelves, and be well lighted and ventilated. On no account ought any sink or drain, even though efficiently trapped, to be laid down in a dairy or pantry.

Failing the provision of such a substantial building as the above, a larder or small dairy of perforated zinc can easily be erected on the shady side of the house. It must not be near to any closet or refuse heap, or to the inlet to any drain.

The Swill-tub.—In our English cottages there is far too much food wasted. Fragments of meat, bread, and vegetables, which the Scotch, and especially the French, housewife would prize as capital ingredients for the broth pot, are thrown away as useless. Nor is the common mode of disposal of them a healthy one. The fragments are generally thrown upon the midden or ash-pit, or into a swill-tub for the use of the pig. The swill-tub is often kept close by the house door, or even in the back kitchen, is rarely washed out, and forms a fruitful soil for the growth of various putrefactive and disease germs. Specially objectionable are the large tanks in use in some parts of the country, kept permanently stocked with a fermenting mixture of sour milk and food fragments.

If such a tank is thought necessary it should be placed at least twenty yards from the dwelling. In any case a swill-tub should be kept in the open air, away from the house, and should be well washed and scalded from time to time. A galvanised iron pail is easier to keep clean than a wooden bucket.

CONCLUSION.

It has been found difficult in the foregoing pages, without undue repetition, to distinguish between directions for the building of new cottages and offices, and suggestions for the repair or improvement of premises already existing. It is hoped, however, that the advice given will be found useful in either case. But while it is above all things desirable that new cottages should be constructed on good principles, due attention being paid to all the foregoing matters, it must be borne in mind that the principal object of the advice here tendered has been the remedy of existing defects.

H. MACLEAN WILSON.

H I N T S

ON

Vegetable and Fruit Farming

(WITH A CHAPTER ON PRESERVING).

FOURTH AND ENLARGED EDITION.

BY CHARLES WHITEHEAD, F.L.S., F.G.S.

SUMMARY OF CONTENTS.

INTRODUCTION.

VEGETABLE-GROWING.

Cabbages—Onions—Carrots—Parsnips—Peas—Cauliflowers—
Broccoli—Brussels Sprouts—Lettuces—Radishes—French Beans
Scarlet Runners—Celery—Marrows—Cucumbers—Tomatoes—
Other Vegetables and Herbs.

THE CULTIVATION OF SEEDS.

DATES OF ARRIVAL AND PRICES OF VEGETABLES.

FRUIT-GROWING.

Gooseberries—Red Currants—Black Currants—Raspberries—
Strawberries—Filberts and Cob-Nuts—Apples—Pears—Plums
and Damsons—Cherries—Fruit for Jam-Making—Fruit Drying.

NEW MODES OF DISPOSING OF FRUIT AND VEGETABLES.

SEVEN ILLUSTRATIONS.

53 PAGES.

Price Sixpence.

LONDON:

JOHN MURRAY, ALBEMARLE STREET.

1893.

PUBLICATIONS

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

QUARTERLY JOURNAL OF THE SOCIETY.

Published March 31st, June 30th, September 30th, and December 31st.

TEXT-BOOK ON AGRICULTURE.

ELEMENTS OF AGRICULTURE: a Text-Book prepared under the authority of the Royal Agricultural Society of England by W. FREAM, LL.D. 486 pp. with 256 Illustrations. Fifth Edition (1893). Price 3s. 6d. bound in cloth.

PAMPHLETS.

PAMPHLETS BY SIR JOHN BENNET LAWES, BART.

VALUATION OF UNEXHAUSTED MANURES. By Sir JOHN BENNET LAWES, Bart., LL.D., F.R.S., and Sir J. HENRY GILBERT, LL.D., Ph.D., F.R.S. Price 6d.

TABLES FOR ESTIMATING DEAD WEIGHT AND VALUE OF CATTLE FROM LIVE WEIGHT. By Sir JOHN B. LAWES, Bart. Price 1s.

VETERINARY PAMPHLETS BY PROFESSOR G. T. BROWN, C.B.

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS. Fourth Edition (1895). 64 pp. With Sixty Illustrations. Price 1s.

ANIMALS OF THE FARM IN HEALTH AND DISEASE. 72 pp. With 52 Illustrations. Third Edition (1895). Price 1s.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHOEING. 20 pp. Third Edition (1892). With Twelve Plates. Price 6d.

CONTAGIOUS FOOT-ROT IN SHEEP (1892). 16 pp. With Eight Illustrations. Price 6d.

ABORTION IN CATTLE. Report of the Special Committee on Abortion in Cattle appointed by the Council of the Society, together with the Complete Minutes of Evidence of the Witnesses examined, and Appendices. 88 pp. (1894). Price 1s.

PAMPHLETS BY MR. CHARLES WHITEHEAD, F.L.S., F.G.S.

HINTS ON VEGETABLE AND FRUIT FARMING. Fourth and Enlarged Edition (1893). With Seven Illustrations. 53 pp. Price 6d.

METHODS OF PREVENTING AND CHECKING THE ATTACKS OF INSECTS AND FUNGI. With Twenty-six Illustrations (1891). 40 pp. Price 6d.

HOP CULTIVATION. With Thirteen Illustrations (1893). 48 pp. Price 1s.

DAIRY PAMPHLETS.

(Issued under the authority of the Dairy Committee of the Society.)

THE PRACTICE OF (a) CHEDDAR, (b) CHESHIRE, AND (c) STILTON CHEESE MAKING. Price 2d. each.

SIMPLE RULES FOR BUTTER MAKING. Revised May 1896. (Sheet.) Price 1d. each or 5s. per 100. Mounted on card and varnished, to hang up in the Dairy, 6d. each. (These Rules can also be had in the Welsh Language.)

OTHER PAMPHLETS.

TECHNICAL EDUCATION IN AGRICULTURE. By W. FREAM, B.Sc., LL.D. With Two Reports by the Education Committee of the Royal Agricultural Society of England. Second Edition (1891). 24 pp. Price 6d.

EXPERIMENTS IN MAKING ENSILAGE DURING THE WET SEASON OF 1888. By the late H. KAINES-JACKSON. 64 pp. Price 6d.

COTTAGE SANITATION IN RURAL DISTRICTS. By H. MACLEAN WILSON, M.D., B.Sc. With Preface by T. PRIDGIN TEALE, F.R.S. New and Enlarged Edition. 32 pp., 12 Illustrations (1896). Price 3d. per copy; 2s. per doz.; 12s. 6d. per 100.

LIST OF GOVERNORS AND MEMBERS OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND. Arranged Alphabetically. Corrected to 31st December, 1895. Price 2s. 6d.

The above can be obtained at the Society's House, 13 Hanover Square, London, W.; or of Mr. JOHN MURRAY, 50a Albemarle Street, W.

COLOURED DIAGRAMS.

(Obtainable from Messrs. W. & A. K. Johnston, 5 White Hart Street, Warwick Lane, E.C., or Edinburgh.)

THIRTY DIAGRAMS OF INJURIOUS INSECTS. Drawn from Nature by Miss GEORGIANA E. ORMEROD, in conjunction with Miss ELEANOR A. ORMEROD, F.R. Met. Soc. Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d. Sets of Six, 7s. 6d.; or varnished and mounted, 12s. 6d.

EIGHT DIAGRAMS REPRESENTING THE LIFE HISTORY OF THE WHEAT PLANT (after FRANCIS BAUER). With Explanatory Pamphlet by W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet) 10s. per Set of Eight Diagrams.

THE POTATO DISEASE. By W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

THE
MAKING OF THE LAND
IN ENGLAND.

BY
ALBERT PELL.

FROM THE
JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND,
SECOND SERIES, VOL. XXIII. PART II. 1887;
THIRD SERIES, VOL. X. PART I. 1899.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1899.

THE
MAKING OF THE LAND
IN ENGLAND.

BY
ALBERT PELL.

FROM THE
JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND,
SECOND SERIES, VOL. XXIII. PART II. 1887;
THIRD SERIES, VOL. X. PART I. 1899.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1899.

PREFATORY NOTE.

THE cases referred to by Mr. Albert Pell in the following valuable historical paper are cited by him as illustrations of his general thesis that "the hardships and exertions of those who, for all historical time, have been making the land are ignored, the result unappreciated, and vague notions of appropriation justified by referring the present value of land to what is termed its unearned increment." This modern value, he argues, can, "in purely rural districts, be directly traced to the expenditure by landowners for years of energy and money, the capital sum of which, when taken into account, may possibly be found to exceed the market value of the estates on which it has been expended."

All the instances of landlords' expenditure given by Mr. Pell, with the exception of the last ("Grundy Fen"), are contained in his paper contributed to the *Journal of the Royal Agricultural Society of England* in the autumn of 1887 (Vol. XXIII., 2nd Series, 1887, pp. 355-374).

No attempt has been made to bring up to date the statistics there given; but the publication in the *Journal* in the spring of the present year of a *Second Retrospect* by Mr. Pell (3rd Series, Vol. x., 1899, pp. 136-141) appears to render appropriate the republication of his original article, with the added facts as to another estate which he has now adduced in support of his contention that "the ameliorating changes in the land have been advanced, not by the silent operations and development of nature, or by the natural increment of value, but by the dogged effort which the landowner, as a rule, has ever put forth in the making of the land, and at any cost fitting it for the practice of improved husbandry suited to the progress of civilisation and the modern wants of the people."

ERNEST CLARKE.

June, 1899.

THE MAKING OF THE LAND IN ENGLAND.

A RETROSPECT.

It is a common observation that the earth belongs to the race. The possession of land is thus regarded as a boon, the title to which is of a nature entirely different from that upon which the ownership of other property depends.

Raw land is, however, only a chance to prosecute the struggle for existence, and those who try to earn a living by the subjugation of raw land, find that they make the attempt under most unfavourable conditions, for land can be "made" or brought into use only by great hardship and exertion.

Men are too frequently blind to the difference between land in a state of nature and as they now find it presented to their eyes in an old and settled country such as ours, and so lose sight of the fact that the real boon or gift which so many covet is to get some land, after somebody else has made it fit for use. In the absence of information, the hardships and exertions of those who, for all historical time, have been making the land are ignored, the result unappreciated, and vague notions of appropriation justified by referring the present value of land to what is termed its "unearned increment."

The difference, however, between man in the prehistoric age and man in the Victorian age is not more marked than that between the condition of the land in the former and in the later period; nor are the struggle and the sacrifice, through many ages, undergone in the civilisation of the one, any more real than those involved in the reformation and improvement of the other.

The present moment, with the rent of agricultural land in England declining under the competition of America and India, is not well chosen for attacking the supposed advantage

landowners enjoy: rather it seems a most suitable season for inquiry, not of a political but of a practical kind, into the causes of the modern value, so as to ascertain whether or no it really depends upon the extraneous influence of the surrounding capital and labour of an industrious and populous society. No doubt such an influence is in operation, and has in some instances an appreciable effect; but the case of the landowner and agriculturist is, that in purely rural districts this modern value can be directly traced to the expenditure for years of energy and money on the subject-matter itself by its owners, the capital sum of which when taken into account may possibly be found to exceed the market-value of the estates on which it has been expended.

This view of the case is put forth and supported by a distinguished American writer,¹ who seems to have anticipated, in the assertion of this claim on behalf of the State, a serious check to the employment of private labour and capital in the subjugation of the prairie and the forest by those whose title to such land is based on a patent from the Federal Government, coupled with industrial occupation.

We in England are at the present day but the heirs or successors to others, who, whether they derived their original title in the wilderness and waste by patent, grant, conquest, diplomacy, or communal inheritance, generally got nothing, apart from wild animals and minerals, for the expenditure of toil and capital in the development of their acquisition, but the chance of remuneration. Any one who will look, for instance, into the history of the "making of the land" in the great level of the fens in the time of the Stuarts, will learn that the chance of remuneration was then anything but a good one for the adventurers and pioneers on those great and useful works.

Some of us have been eye-witnesses of the nature and extent of the warfare of human industry against natural obstacles in the New World, of which Great Britain in recent years has furnished only occasional examples. Possibly ninety-nine out of every hundred of the present inhabitants of England can form no conception of the character and severity of this struggle, and it may not be out of place to reproduce a picture of it as drawn by De Tocqueville from personal observation. He says:—

The bells round the necks of the cattle announced our reproach to a "clearing" when we were yet a long way off, and we soon afterwards heard the stroke of the hatchet hewing down the trees of the forest. As we came

¹ Professor Sumner of Yale College.

nearer, traces of destruction marked the presence of civilised man ; the road was strewn with shattered boughs ; trunks of trees half consumed by fire, or cleft by the wedge, were still standing in the track we were following.

Beyond a field, at present imperfectly traced out, we suddenly came upon the cabin of its owner, situated in the centre of a plot of ground more carefully cultivated than the rest, but where man was still waging unequal warfare with the forest ; there the trees were cut down, but their roots were not removed, and the trunks still encumbered the ground they had so recently shaded.

The master of the dwelling belongs to that restless, calculating, and adventurous race of men who do with the utmost coolness things only to be accounted for by the ardour of the passions, and who endure the life of savages for a time in order to conquer and civilise the backwoods. By the side of the hearth sits a woman with a baby on her lap ; her delicate limbs appear shrunken, her features are drawn in, her children are the true children of the wilderness, full of turbulence and energy. She watches them from time to time with mingled melancholy and joy. To look at their strength and her languor, one might imagine that the life she has given them has exhausted her own, and still she regrets not what they have cost her. In the one chamber of which the house consists the whole family is gathered for the night.

The dwelling itself is a little world—an ark of civilisation amid an ocean of foliage ; a hundred steps beyond it the primeval forest spreads its shades, and solitude resumes its sway.¹

Our English ancestors have undergone at home the same toil and privations in their conflicts with Nature. The wolf had to be extirpated before the flock could be safely established ; the forest had to be cleared before the open field could be set out ; the great river to be embanked before the flood could be restrained, and the fen made only summer land. This, however, was but a first approach towards cultivation.

The communal occupation of this virgin soil soon came under the necessity of regulation and order, to become of any real service to an advancing and growing population not content to remain savages. The commonable lands had to be set out in strips with owners' rights, not yet indeed complete, but sufficiently appropriated to allow of some private enterprise in the growth of grain. The manor-house, the church, and the homesteads appeared on the scene, shelter for cattle was provided in winter, and the breeds improved. With buildings and arable husbandry and winter shelter, came the need for bridges, ferries, roads passable in summer ; unserviceable, indeed, in winter, but, such as they were, constructed and maintained solely by those who had subjugated and brought into cultivation the soil over which they passed.

People now living may have seen decaying under the walls of a parish church the enormous wooden plough, girt and

¹ De Tocqueville's *History of Democracy in America*.

stayed with iron, which, as spring approached, was annually furbished up, and brought into the village street. For this the owners or their tenants, acting in concert, made up joint teams of six or eight powerful horses, and proceeded to the restoration of their highways, by ploughing them up, casting the furrows towards the centre, and then harrowing them down to a fairly level surface for the summer traffic. They have lived to see the same highways first and for years mended with weak and rotten sand and gravel, and finally hardened and rendered water-proof, with granite, transported fifty miles or more for that purpose.

Progress, however, was stayed by the exercise of the remaining communal rights, and a further step was taken by the owners to allot among themselves in severalty that which hitherto they had enjoyed in common, and to free their cultivated lands from the customary right exercised by sheep-masters and the owners of commonable cattle and animals, as well as the otherwise incurable evil of a prescriptive course of cropping which rendered the provision of sufficient winter food an impossibility. At an enormous expense this last great step towards efficient tillage and grazing was carried out with the sanction of Parliament, and the way was clear for the erection of suitable homesteads, no longer huddled in the villages, but placed in the newly set out freeholds, and for the complete removal of the superfluous water by open ditches and under-drains. The English landowner was not slow to make use of the opportunity now given for laying the soil dry, and for sheltering and subdividing his cattle by enclosures fenced off by hedges or stone walls, and the cost value of the made land of the empire was speedily raised by the enormous expenditure on these works.

There are other subsidiary and local improvements that must not be overlooked, such as warping, claying, marling, pumping from low levels, all of which operations have necessitated an outlay of capital, and a periodical charge for renewal, without which the soil would be entirely unfitted for modern husbandry. There is, it may be broadly asserted, but a small portion of rural England the present value of which is not due wholly or in a very large part to the costly operations to which reference has been made, and which have been conducted wholly at the charge of the successive owners of the soil.

In the twenty-fourth volume of the First Series of the *Journal of the Royal Agricultural Society* Mr. Belcher has drawn a remarkably clear picture of what remains to be done after the forest trees of wild land have been removed. Speaking of Wychwood Forest, then recently grubbed up, he says:—

The land, when given into the hands of the new tenants, presented anything but a smooth inviting appearance. Wide ditches, and long irregular high banks that had formed the boundaries of the different coppices; deep pits and hollows, where stones had been dug for the use of bygone generations; small straggling briars that had escaped the notice of the wood-grubbers; roots of trees and underwood left a few inches below the surface; large patches of rough brown fern stems that had afforded cover to the fawns;—all these and many other impediments stood in the way of the “forest farmers,” and made “speed the plough” an earnest desire with the ploughmen, but seldom realised; for it was with the greatest difficulty that four strong horses drawing a large iron plough could break up half an acre a-day, and many and long were the blacksmiths’ bills for repairs to the tackle where the plough was used in breaking up the soil. Some of the tenants tried digging at a cost of 3*l.* per acre; some used stocking hoes and grubbed the ground 5 inches deep, carefully picking out the large stones that were beneath the surface: this plan cost 50*s.* per acre.¹

These operations, however, laborious and costly as they proved to be, left the land but poorly prepared and wholly unfurnished for farming operations, unless the surface had been there and then sown down in one prairie to grass, for which it would have even then required some such previous operation as breast-ploughing, at the cost of about 23*s.* an acre. For the growth of grass and winter food, for local traffic, for the shelter of man and beast, the owner had further to provide roads fenced in with boundary-walls, or quick-fencing taking five years at the least of careful nursing and effectual protection to rear and establish.

Farmhouses, cottages, wash-pits, cattle-pens, waterings, plantations and gardens had further to be provided. The high-ways would come to 700*l.* per mile, the occupation roads to about half that sum. The two boundary-walls would come to 200*l.* per mile, or, if the fencing was done with quick, to a little larger sum. At least that was the case in the reclamation of Wychwood Forest. There still remained the first thorough draining of the new fields to be executed, at a cost to the owner of from five to seven pounds an acre.

There is no operation brought into this statement which it has not been incumbent on the owner to execute on the soils of England in general cultivation. The chalk downs stand in a category by themselves, to which these remarks would not apply. The sands and gravels would not require under-draining, but their texture would on the other hand require strengthening and cooling by the expensive process of marling or chalking.

Wychwood Forest, as we have seen, furnishes an instance of the subjugation of wild land and its conversion to a condition fit for all the purposes of modern husbandry within the present

¹ R.A.S.E. Journal, Vol. xxiv., 1863, p. 281.

generation. Processes which have been slowly worked out during centuries were here undertaken and completed in almost as many years. The English flora and fauna in all their natural fitness and beauty were violently and ruthlessly destroyed to make way for artificial grasses and cereals, the imported root-crops, and the less graceful forms of domesticated farm stock. The transformation, though costly, was complex and complete.

We will pass from the centre of England to the north, to a tract of high land, the home of the grouse and wild-fowl at all seasons, and the outrun during summer for some hardy hill stock. The soil itself, not sour or sterile, invited the hand of a generous and wealthy improver; the climate indeed suggested caution, but even that hope held out might be ameliorated, if the ever-present cold wet in the soil could be removed, and the driving blasts and storms be broken by stone fences and shelters. Though the growth of grain and crops in rotations was admittedly out of the question, the more moderate and simpler enterprise of improving the permanent pasture by the removal of the heather, by liming and draining, seemed to offer a fair prospect of return for the outlay.

The moor in question contained 5,750 acres, for the most covered with heather, and before the improvement was excellent grouse ground. The portion improved was originally the best part of the moor, and comprises 656 acres. The reclamation was carried out about thirty years ago, and at that time the rent of the whole moor was 200*l.* a year, or 8*d.* per acre all over; while the value of the better portion selected for reclamation might be taken to have been 1*s.* an acre. The undertaking, which extended over a period of fourteen years, consisted in draining, liming, stone-fencing, building cattle-sheds for shelter, and water-weiring, that is, protecting the banks of streams by stones or wattling:—

	<i>l.</i>	<i>s.</i>	<i>d.</i>
The draining cost	5,587	4	0
Liming	8,255	16	4
Fencing	616	7	5
Water-weiring	224	2	2
Cattle-sheds	517	4	1
Sundries	790	0	3
Total	£15,990	14	3

From the above it appears that these simple operations cost no less than 24*l.* 7*s.* 6*d.* per acre. There was nothing unusual or fanciful in their character; they consisted solely in removing

the superabundant water from the soil by draining, in keeping the torrents within bounds, in sweetening and improving the pasture by lime, in enclosing with walls built of stone found on the spot, and in erecting shelter for the animals brought on to graze. Thousands of other acres have been thus reclaimed from time to time. For some years the whole moor was kept in hand, and grazed with cattle and sheep, and in 1867 it was let as a farm at the annual rent of 800*l.* In 1874, on a revaluation, this rent was increased to 824*l.*, the improved land being then valued at 6*s.* 8*d.* per acre. The result of the operations, therefore, financially, is an expenditure of 24*l.* 7*s.* 6*d.* an acre (more than half of which was for liming, the effect of which cannot be regarded as permanent), and an increased rental of 5*s.* 8*d.* an acre, or a little over one per cent. on the capital employed. There can be no grounds in this case for assuming that the owner has been benefited by any "natural increment of value." On the contrary, the case furnishes a very striking and useful proof of the need of caution and moderation on the part of those who might be inclined to fasten on owners a legal obligation to bring waste lands and grouse moors into cultivation.

To complete the history of this improvement, it must be added that whilst the land when covered with heather was a splendid piece of grouse moor which would now have commanded a game rent of 2*s.* 6*d.* per acre, it has been rendered valueless for that purpose: so that deducting, as is proper, this sum from the improved rent of 5*s.* 8*d.*, we arrive at a net financial gain of 3*s.* 2*d.* per acre, or a return of about 13*s.* per annum on an expenditure of 100*l.* If either by the unflagging zeal of the owner or, as is sometimes suggested, under State compulsion, the improved condition of the land is to be preserved, the liming, the effects of which are gradually wearing out, will have to be renewed at a cost which, with present prices of produce, hardly promises to be remunerative.

Another instance of reclamation of waste land in a northern county of England may be worth mentioning. The common comprised about 4,000 acres, one half of which was enclosed about 1881 under the authority of Parliament. The proprietor of an estate in the manor, who was favourable to this enclosure, received in respect of such estate an allotment of 113 acres of cold moorland, growing rushes and coarse grass. At a cost of 400*l.* this was fenced and open-drained, and the enclosure expenses discharged. The largest offer to rent this allotment has been 12*l.* Probably at the present time it would not command 10*l.* And as the common right prior to the enclosure

was worth about 5*l.*, the resulting net gain from this improvement or subjugation of the waste has been 5*l.* per annum, or 1 $\frac{1}{4}$ per cent. on the capital applied.

It will be proper next to examine into the extent and cost of those secondary operations which a survey of the general features of the country informs us must have followed its recovery from a state of nature, and to estimate the approximate cost per acre of such operations. For this purpose examination has been made, with the aid of the 6-inch Ordnance Map, into their nature and extent in a selected parish. The one in question is in the Midland counties, remote from any considerable town, has a population less than 150, and probably never has had one of more than 200. It was enclosed in the reign of Elizabeth, being at that time for the most part open unenclosed commonable fields of arable and lammas land, some brakes of thorns and gorse, with a few old enclosures, probably not above 50 acres in extent, around the messuages, tofts, and church. The area was, and is, 1,648 acres. The surface soil is of a most varied character, some heavy clay, a small amount of gravel, more loam, and a considerable tract of red oolitic iron formation. It is extremely undulating and has been full of dangerous bogs and springs, the drainage of which has been difficult and costly, but not more so than has been the case in the surrounding parishes. To draw off the spring water many of these drains have been cut to the depth of 15 and 20 feet.

The snipe, the dotterel, and woodcock, which up to the beginning of the century were common, are now hardly ever seen. As late as 1808, private diaries show that the squire of the place spent many a night with his draw-nets and setters in taking these birds, as well as other winged and ground game, the remains of a practice that no doubt was common enough before the days of enclosure. The badger, the fox, the founmart and mole were all placed in the same category of destructive vermin, and the hand of man was raised without any discrimination against them. The visiting of neighbours at any distance was suspended from October to April, and the coal, which was fetched from a considerable distance, was laid down before Michaelmas. The ways and roads were then broken up by the weather and were abandoned as unfit, alike for light vehicles and heavy-draught waggons.

The surveyor's map of the Elizabethan deed shows that the proprietors divided their new allotments into eighteen large enclosures, to which were added sixteen small crofts adjoining the thirty houses of the inhabitants, whose census came probably to about one hundred and fifty souls. Forty years ago there

was no hard road to the adjoining village on the south, and even now the hard road to that on the north is in places not even commenced.

The parish has ultimately been subdivided into 150 fields, now traversed by over three miles of substantial public carriage ways, with the addition of about one mile of occupation roads, giving access from the former to the properties of several owners. The public ways were set out in the Elizabethan deed 60 feet wide; they are now reduced to 30. At this width they appropriate 33 acres of land over which the public enjoys rights of free passage, insisting at the same time on the maintenance of a hard level weather-proof track of ample width, made, preserved, and protected solely at the cost of the proprietors of the land through which they pass. The cattle of the owners of the soil are prohibited from grazing its sides, and the very hedges and trees, which might and which have afforded them shelter, have to be reduced to statutable dimensions for the convenience and enjoyment of the casual wayfarer. These desirable results, attracting so little remark, regarded as they are as matters of course, and almost the production of Nature, have been effected only at a heavy charge on the real estate of the parish. Fifteen acres at the least are entirely lost in the metalled surface of the highways, and the account for the whole of the secondary works of reclamation will stand approximately as follows:—

	£
3½ miles of parish roads, at 700 <i>l.</i> per mile to make . . .	2,216
The two boundary fences on either side, at 200 <i>l.</i> per mile	633
The one mile of occupation road and its fences	550
26 miles of quick fences to the 150 enclosures, at 112 <i>l.</i> per mile	4,032
200 gates and gateways to the enclosures, at 40 <i>s.</i>	400
1,600 acres drained at 6 <i>l.</i> 6 <i>s.</i> per acre, say	10,000
Total	£17,831

But the record cannot be closed here. Roads without bridges, carriage-ways without footpaths and causeways, grazing grounds without waterings, lairs, or cattle-pens, would be regarded as incomplete. Even the prairie requires its corrals. Rights of way, allotments, orchards, buildings for the poor, and graveyards must be taken into account before the average cost value of an acre in the typical parish can be estimated.

Beyond this there remains yet one noteworthy adjunct, which from the earliest time to the present has marked and capped

every advance in civilisation that has given character and value to country estates.

The owners of the soil, sometimes with enthusiasm, sometimes without, but still always somehow, have regarded the erection and maintenance of a place of public worship as a work without which their rural economy would be incomplete. To bring the expenditure on this head into the account is no fanciful or extreme stretch of the imagination, but would on reflection seem to be a solid actuarial item in the schedule of operations, by which our ancestors enhanced the value of every rood of their possessions, and which must not be overlooked in discussion with those who trace so much of the rise of income to the natural increment of value.

There will now be no difficulty in accounting for an additional expenditure of 1,600*l.* to 2,000*l.* on the operations necessary in the selected parish to provide the equipment for the development of modern husbandry; this will raise the cost of the secondary operations to about 20,000*l.*, a sum equal to 12*l.* per acre. If we add 5*l.* an acre more for the cost of such work as Mr. Belcher describes in Wychwood Forest, we get a sum of 17*l.* per acre, and still we have not a house or homestead erected, a tree planted, a hovel raised. * These particulars will be dealt with, and their importance as factors in the value of land perceived, when we come to the consideration of the actual expenditure about them on estates selected for example; but a very careful and useful estimate of their cost has been furnished by Mr. E. P. Squarey in his article on 'Farm Capital,' to be found in Vol. XIV. of the 2nd series of the Journal of the Royal Agricultural Society (1878).

Mr. Squarey says the landlord's capital is—(1.) The land. (2.) The buildings, roads, cottages, fences, &c. (3.) The expenditure in arterial or thorough draining, warping, chalking, marling, and other more or less permanent methods of increasing the productive capacity of the soil. It is with the second item we have now to do, and Mr. Squarey's estimates are based on the following illustrations:—

A. A dairy farm of 200 acres, 15 per cent. arable; annual value, exclusive of tithe, 50*s.* per acre; cost of buildings, including house and two cottages, 2,550*l.*, or 12*l.* 15*s.* per acre.

B. Mixed arable and pasture farm, 500 acres tithe-free at 30*s.* per acre rent; house, farm, and six cottages, 4,000*l.*, or 8*l.* an acre.

C. Mixed upland, arable and pasture farm of 1,000 acres, at 20*s.* per acre; farmhouse, buildings, and thirteen cottages, 6,350*l.*, or 6*l.* 7*s.* per acre.

The average in these three illustrations of the cost of buildings turns out therefore to be 9*l.* per acre, which, added to the previous calculation of 17*l.*, brings up the amount of the owner's expenditure to the sum of 26*l.* per acre.

For some such outlay as this, or its equivalent, at the time when the several operations were carried out, the open wild waste, denuded of saleable timber, mere rough naked land in fact, has been converted into cleared and levelled enclosures, ready for the occupancy of the cultivating farmer and his staff.

Having thus taken a view of the processes involved in the making of the land, the consequence of these operations and the further demand on the resources of those who have carried them out, in order that their efficiency should not be impaired, will have to be considered. This efficiency is maintained by renewals—renewals of operations and improvements which it is too much the custom to regard as permanent, when no such thing as permanency has been achieved. The life of these improvements is not perpetual, that of some is actually transient. If the primary operation, such as grubbing and levelling, be excepted, which once done may be said to be done for ever, there is not one that does not become from the date of its completion the source of anxiety as to its protection and preservation, and of consequent further expenditure of capital.

The first execution of such works has all the charm of conquest surrounding it—it is greeted with the applause of admiring citizens, the successes are tabulated and advertised, the failures are never mentioned. While the field laughs with grain, it is more than possible that the owner groans at the cost of its artificial fertility, and finds too late that high farming is not the remedy for lowering prices. Too often he must feel it would have been better to have left the down unbroken, the copse ungrubbed, the gorse and heather to bloom in peace, the sullen clay undrained, the boulders where they lay on the moor and the grand homestead in the architect's office. The mention of an inspector or commissioner sends the same sort of cold thrill through him as such references would among the criminal classes, and he curses the day when modern legislation enabled him through such agencies to burden his acres with debt, and to excite at the same time the cupidity of the ignorant and unscrupulous theorists who would appropriate what shadow of net income might remain to him, under a claim on behalf of the nation to the "natural increment of value." In such cases—and there are thousands of them—there is, instead of any natural increment of value, an artificial depletion of income.

As far as our experience reaches, the efficiency of modern

under-drains cannot be counted on beyond a term of fifty years : in very many cases renewal has been found necessary at the end of thirty, either from the decay of the material used, as straw, turf, or wood, the defective design of the drain tile, as was the case in the old horseshoe tile, or the small diameter of the pipe, the inroads of moles, the entrance of roots, or deposit of silt and mud. Sometimes a zeal for universal deep work in soapy clays has ended in a suffocation of the passage, and caused an early substitution of shallower channels ; sometimes the burial at the bottom of broken stones with pipes placed on their top, sometimes the direction in which the drains were set out, frequently the distances allowed between them, have speedily terminated the useless life of the fashionable bantling, leaving a legacy of debt and a heavy charge inevitable for renewals.

The expenditure on such enterprises must not be forgotten by those who would record the cost of the subjugation of the English soil. It may be contended that money thus thrown away should not be taken into account. Be it so : but the experience derived from such mistakes, as an asset, has its value—a very sterling one—and something on its account must be credited in estimating the capital expenditure which goes to make up the value at the present day of ordinary farm lands. It is not the building of the vessels and the pay of the crews only that make up the cost of navigating our coasts : it is increased by a charge for beacons, buoys, and lights, warning the sailors of the hidden rocks and shoals on which so many have gone to destruction. The renewals of fences, where they have been neglected, is a constant source of expense, since (even where tenderly cared for) whitethorn and blackthorn and hazel are not immortal. The perpetual clearing out and deepening of outfalls, the renewals and repairs of fen and marsh banks and dykes, the maintenance of the machinery, without which it would be flooded, are continuous and costly, coming on some of the inferior levels to an annual cost of from 4s. to 6s. an acre.

Finally, it should be noted that it is upon land which in a state of nature was of an inferior value, either from its situation or poverty, that we meet with the marked instances of an appreciation of value due, as we have seen, to the lavish expenditure of extraneous capital. Fen districts, sandy heaths, vitriolic gravels, sullen clays, stony wildernesses, furnish the standard examples of improved rentals and reduced incomes. Arthur Young described one of his improved occupations in Middlesex as the “maw of a devouring wolf,” the very reverse of the character an inexperienced observer would have bestowed on it.

One of the most successful and wealthiest men of business in the Midland counties, a very considerable landowner, whose family for a century back have been signally connected with the advancement of agriculture, told the writer in the forties that "he could not afford to buy land at less than 90*l.* to 100*l.* per acre"—meaning, it may be presumed, that an income might be calculated on with certainty when the elements of fertility are in natural abundance and convertible into human food (as in the best grazing lands) without expenditure upon houses, cottages, and buildings; while in the other case, though the saleable products might be as considerable or even more so, the income they yielded was too seriously diminished by the cost of the artificial means necessary for their acquirement. This reasoning seems to be sound, for it is notorious that the rents of these fine soils covered with the best natural pastures have hardly yielded to the pressure of bad times, while rents enhanced by improvements have gone to pieces, and in many cases down to zero.

Such examples as these are, however, of very limited amount, though possibly there is not a county in England that is entirely devoid of them. They will be found for the most part in the Midlands, and on the spots where the Kimmeridge clay and greensand come to the surface, as well as in river valleys and flats which for years have had the fertilising washings of the surrounding slopes brought down upon them by the action of frost and water. But even in the finest grazing pastures in Leicestershire and Northamptonshire, whatever may have been the practice fifty years ago, it would be wrong to conclude that at the present day the extraordinary richness of their grasses is due entirely to nature.

Some years ago Sir John B. Lawes commenced a scientific enquiry into the causes of the fertility and the feeding properties of the best land near Market Harborough, and for this purpose he desired to select for examination portions of fields on which no artificial food had been consumed. After long search none could be found absolutely free from this disqualification. Upon the greater portion of this magnificent district it turned out that linseed or cotton cake was in common use and in considerable quantities, dissipating the general idea that the "rother's side is larded" solely by natural grasses. A little help no doubt goes a long way on such pastures, but the grazier has proved that it is better to give it—possibly with the view of early maturity—than to rely exclusively on what the landlord's freehold furnishes in return for the rent.

Passing then from the cream of the English soil, we come

to the considerations of some instances selected for the purpose of showing the extraordinary and unsuspected outlay which has been continuously going on in order to produce or to maintain the rent-roll of purely rural estates.

It has been found no very easy matter to arrive at the particulars, or even the sum-total of this outlay, so as to get at a statement of averages. A vast amount of the improvements of the land has been due to sentiment and not to economical calculations. Arthur Young suggests the morning stroll of the owner, and his casual and unpremeditated conception on the spot of some operation which would improve the natural features of his estate, and perhaps employ his people, as the origin of considerable outlay. Of such probably no very accurate accounts are now to be found. Much of it perhaps might be termed extravagant, and in respect of direct results, unproductive; but none can doubt that the finished charm and wealth of English scenery are traceable to such efforts, and that much of the value (the residential value certainly) of rural property has resulted from them. It is doing scant justice to our ancestors to discredit or forget their practical regard for ornament and progress as they understood it, and ungraciously ascribe its economic effects entirely to the "natural increment of value."

Fortunately, however, in some instances estate accounts have been kept and preserved in a manner sufficient to establish without doubt the contention that on a comparison of expenditure with the present capital value, much less than is thought will be found left for the prairie value of the land.

The county of Huntingdon is one essentially free from urban activity, and the local wealth which it creates. A considerable portion of it still shows traces of the forest with which it was once clothed. A large part of its north-eastern margin was very recently a fen sidden with moisture, or bright with water, skirted with reed and sedge.

The residents are the successors of a generation who were content to sow the skirts of their highlands where they dipped into the fens with no nobler grain than oats, to see them too frequently ripening so late that the practice was to leave them standing till the water rose among them a foot or more in depth, waiting with patience till winter set in, and access to the crop was afforded on the ice. Then at last, equipped with poles and sleighs, the villagers entered on the untimely harvest, and, breaking off so much of the crop as stood above the ice, they gathered it on the sleighs and removed it to the edge of the highland for storage.

The woods are now fewer and far between; the meres are

bright, not with water, but with spring green and (in the absence of blight) with autumn gold. Spacious and substantial farm-houses and buildings have replaced the decoy and the charcoal-burners' camp, while the wattle and daub hut, with its thatched roof snug and picturesque, has disappeared for a modern brick substitute, answering indeed to the idea of decency and salubrity, but at the cost of rustic beauty and some domestic comforts.

Have these striking changes brought with them a corresponding financial return for the sacrifices which have been made for their achievement? Some answer may be found on an examination of a case in point.

CONNINGTON ESTATE.

The Connington estate, the property of J. M. Heathcote, Esq., in Huntingdonshire, is situated on the borders of the higher lands of the Oxford clay formation, where it descends and merges into the alluvium of the fen lands of Whittlesea and Holme. Part, therefore, is heavy clay, the poorer portion of which is or was woodland and store-grass land. The other part is light fen land, "blowing" in the dry March winds, and of a loose texture. Situated between the two is a considerable amount of mixed soil of good quality, growing good timber, and carrying heavy sheep, and excellent pasture for milk and store cattle. For eighty-seven years the proprietors, a father and son, have resided on the estate, bestowing on it all the personal care and outlay which a love of country life and a sense of duty would prompt. Without yielding to "fads" and whims, all that modern science and practice in agriculture sanctioned has been respected and made use of here. Nothing seems to have been carried out on the one hand in a mean and niggardly fashion, while on the other there is no evidence of extravagance or indifference to economy.

The gross rental, inclusive of that from small holdings and cottages, has been as follows since the beginning of the century:

£		£	
In the year 1800 it was	3,603	In the year 1850 it was	7,004
" 1810 "	6,908	" 1860 "	9,592
" 1820 "	7,840	" 1870 "	10,376
" 1830 "	6,706	" 1880 "	7,185
" 1840 "	6,449	" 1886 "	7,130

But it must be remarked that the rental of 1886 is not all actually received from a tenantry, but is the sum given on the basis of a

valuation; a large portion of the estate being in the hands of and cultivated by the owner.

The expenditure on the enclosure of one parish, the purchase of land, drainage, building, and repairs, or renewals, comes to no less than 143,798*l.*, as below.

	£
Farm premises, cost and repairs . . .	41,311
Cottage repairs between 1860 and 1885 . .	4,564
Public drainage of fen, say . . .	3,000 ¹
Internal drainage of fen . . .	11,213
Highland drainage . . .	31,920
Road made . . .	2,190
Purchase of land . . .	44,089
Enclosure of one parish . . .	5,511
Total	£143,798

The expenditure on residence, cottages, restoration of churches, special fen taxes, materials, and agency, brings up the capital sum expended to 218,446*l.* Now, supposing this sum had, as it accumulated, been hoarded instead of expended on this estate, and was to be now brought to light and placed out at interest of 4 per cent., an income of no less than 8,738*l.* a year would be the clear result, or 1,400*l.* a year more than the present gross income of the whole improved estate in 1886, after adding to the rental of 7,130*l.*, 200*l.* for the mansion, making in all 7,330*l.*

Supposing, which is believed to be the case, the outlay in question has been spread over the eighty-six years of this century, the estate may be debited with an annual charge in respect of one half of 218,446*l.* for eighty-six years, equal at 4 per cent. to 4,369*l.* a year. Had this outlay never been made by the owner, it is not to be believed that the estate would have been unproductive. On the contrary, with security of tenure at a low rent, tenants would have been found to execute some improvements and renewals or repairs at their own cost. With a system of building leases even cottages might have been thus erected, as it is understood has been the case on one or more large estates. The owner might possibly have felt called upon to renew or rebuild the farm-houses, to execute the arterial drainage of the fen land, and to take upon himself the enclosure of the open field parish, the repair of the churches, and the finding of some material. The estate is included in five parishes, and consists of 111 acres wood, 4,557 acres arable, 1,589 acres pasture, 800 acres fen land under plough. The highland cost 6*l.* an

¹ Raised by an annual tax, averaging 11*l.* per annum, and extending over eighteen years.

acre to under-drain, the tiles being made on the estate. The woodland produces no net return.

HOLKHAM ESTATE.

The estate of the Earl of Leicester, K.G., at Holkham in Norfolk, furnishes another striking illustration in support of the contention that value is due to outlay, and that some of the most splendid exhibitions of fertility and agricultural wealth are traceable, not to natural circumstances, but rather to the continuous systematic applications of skill and of extraneous capital on the soil.

In the following statement the Park and Domain, with the mansion and buildings pertaining to it, are excluded; as well as the Marsh farm of 459 acres.

The amount expended by the late Earl of Leicester		
on buildings and repairs from 1776 to 1842 was	£536,992	
By the present Earl of Leicester for buildings and		
repairs, gates and fences, and under-draining,		
from 1842 to April 1, 1883, was	£344,994	} 490,218
For purchase of land	145,224	

Total . . . £1,027,210

	£	
The net income of the Estate in 1841 was	30,499	
The average of ten years to 1841 was	25,208	
The net income in 1860 was	26,746	
The net income in 1882 was	25,402	
The net income in 1885 was	27,523	

It is interesting to examine, by the way, the payments which in the year 1882 came off the year's income of 52,285*l.*, amounting as they do to over one-half of this gross income. They were as follow :

	£	s.	d.	£	s.	d.
Land tax	1,410	2	7			
Property tax	1,183	0	10			
Out rents	4,879	10	5			
Parochial rates	279	4	1			
Tithe rent charge	6,481	3	0			
Voluntary payments	680	17	7			
				14,913	18	6
Buildings and repairs	8,836	4	6½			
Gates and fences	401	1	5½			
Under-draining	1,192	14	7			
Law charges	146	7	3			
Management	1,303	17	10			
Sundry disbursements	81	2	9			
				11,961	8	5
Total say,	£26,875	0	0			
Net profit say,	25,410	0	0			

The average cost from the year 1852 to the year 1883 has been annually

	£	s.	d.
For buildings and repairs	8,033	6	0
Gates and fences	332	11	8
Under-draining	760	4	5
Total	£9,176	2	1

The amount annually expended in buildings and repairs alone from Michaelmas 1815 to April 1868, a period of fifty-two years, was 8,371*l.* 18*s.* 3*d.*

Here we have an instance of an expenditure during 107 years of over one million sterling on one estate, in the purchase of land and in work and payments necessary to insure this rental of 52,285*l.* Applying the same rule as in the Connington case, and taking the interest of half this amount at 4 per cent. during the whole period, the proprietor from this source alone would have derived an annual income of 20,000*l.*, only 5,410*l.* less than the net income of the improved and enlarged estate at the present time; or if the owners had only hoarded the sums annually spent on the maintenance of their estate during the period under consideration, and had in the year 1883 brought the accumulation into beneficial use by investing it at the rate of 3½ per cent., the possessor would be in the enjoyment of an income of 36,000*l.* a year. The estate, less the amount purchased, would also be his, not indeed in the high condition which now distinguishes it, but still we may conjecture productive of some, though a considerably less, rental.

Having now given some instances of the expenditure of a large sum per acre in the reclamation and improvement of land in the eastern and northern counties of England, another may be added of a more ordinary character in the south-west, where the expenditure in relation to the rental has not been so considerable, and where the execution of the improvements has not attracted such general attention from its novelty or its extent. It gives, therefore, perhaps in some respects a truer sketch of the operations which have for years been quietly carried on by English landowners in the ordinary management of their estates.

EARL BATHURST'S ESTATE.

The property in question belongs to Earl Bathurst, who has kindly furnished the following particulars concerning it. The purely agricultural portion, occupied by tenant farmers, consists

now of about 6,100 acres. In 1825 its extent was 4,920 acres; nearly 1,200 acres have been subsequently added by purchase from time to time at a cost of over 40,000*l.*

A home farm of 1,209 acres, on which about 3,000*l.* has been expended on new buildings and cottages, besides further sums on annual repairs, is not included in this statement. All contributions and subscriptions to the restoration of churches and vicarages, the maintenance of schools, the erection of a village coffee-tavern and similar matters, as well as the expenditure of 2,300*l.* on a cattle-market upon the estate, producing an annual income of about 80*l.* from tolls, are omitted here from consideration. A sum of 1,205*l.* is, however, included in the outlay of 1877, which was spent in the construction of water-works for the supply of one village and some high-lying land on two farms.

With regard to the rental, this from 1851 to 1879 was based on the price of wheat, when in the latter year the tenants expressed a desire to revert to fixed payments. The rent received amounted, on 4,920 acres, in the year 1825, to 5,521*l.*; in 1830, to 5,519*l.*; in 1840, to 5,904*l.*; in 1850, to 6,143*l.* on 5,290 acres; in 1860, to 7,678*l.*, the acreage being then 5,685 acres; in 1870, to 7,789*l.*; in 1880, on 6,100 acres, to 6,560*l.*, and in 1885 to 6,177*l.* on the same acreage. The consideration of these figures is instructive, showing as they do that in 1825 the gross rent was 22*s.* 5*d.* per acre as against 20*s.* 3*d.* in 1885, notwithstanding the outlay of 12*l.* per acre since that date. The gross sum expended on the property between 1825 and 1885 inclusive came to 67,438*l.* on new farm-houses, buildings, cottages, general repairs, and draining, though only 1867*l.* is accounted for under this last head. As the cost of the purchased land, including law and other expenses, comes to about 42,500*l.*, there appears thus to have been a grand total of 110,000*l.* spent on a property which produced in 1885 a net rent of only 4,600*l.*

The interest on 110,000*l.* at 4 per cent. is 4,400*l.*, showing that within the last sixty years Earl Bathurst and his predecessors have practically bought and paid for their own agricultural property in hard cash. In other words, if they had not laid out a shilling in repairs on these agricultural holdings during the last sixty years, and had not purchased additional agricultural property for the improvement of their estate, but had invested the money so laid out at 4 per cent., the present owner would have been able to let the original agricultural estate of 4,920 acres at one shilling an acre last year, and would be now

actually in receipt of a larger return than he is possessed of under present circumstances.

It will be possibly urged that the cases quoted are exceptional, and not fair illustrations of the argument of the writer. Those who advance this objection would do well to bear in mind the length of time which has been occupied in bringing this fair realm into the condition in which we now find it; how impossible have been the operations without legislation; how slow and costly legislative processes are; how system after system has been abandoned and resumed under the influences of wars, treaties, and commercial changes; how sometimes the ignorant obstinacy of the wealthy or the popular prejudices of the masses have impeded or suspended remunerative operations; how sometimes violence has been used to put an end to the efforts of the improvers; and how the laws of real property, with their costly complications and the heavy demands of the exchequer, have closed the markets to those who might desire to realise on their improvements.

Let them bear in mind that the owner and cultivator of the soil has a fickle partner, from whom he can never divorce himself, in the person of Nature. Her whims and ways are beyond calculation. Mistress of such mighty agents as droughts, floods, frost, and heat, she too often makes a disastrous end of the best devised schemes for improvement. You can impose no restraint on her. You cannot command the temperature of a county as you would that of a cucumber-frame or a factory; you cannot carry the sun in one hand and a watering-pot in the other. The most a prudent improver can do is to humbly provide for contingencies, to remember that at present there are no exact rules of science under which he can conquer this dour earth of ours; and costly though it be, he must be content to do what, with no assurance of great reward, his ancestors have done before him—adopt those measures which many failures and much painful experience have shown to be of most service in the particular spot on which he applies his energies and resources.

Side by side with social progress the ameliorating changes have been advanced, not by the silent operations and development of Nature or by the natural increment of value, but by the dogged effort which the landowner as a rule has ever put forth in the making of the land, and at any cost fitting it for the practice of improved husbandry suited to the progress of civilisation and the modern wants of the people.

GRUNTY FEN.

A more recent illustration is to be found in the recovery of 1,350 acres of land and swamp in a state of nature about 40 years ago, the inclosure award being dated December 19, 1861. The land in question was intercommonable of seven parishes, and its corporate existence would be found indicated in the map of Cambridgeshire under the extremely puzzling and unromantic title of Grunty Fen. It was a hollow surrounded on all sides by the low hills or "highgrounds," as they are called, of the seven interested parishes; it dipped to its lowest level towards the north, where was a tract of poor soil and pools for the most part swampy all the year round. Here was the natural gullet, formed by a dip in the high ground, through which the overflow of the stagnant water would discharge itself, but still leaving behind a depth sufficient to cover a very large portion of the Fen beyond the extent of the peat earth. Almost in the centre of the fen on its longer axis from east to west the surface rose a few feet, sufficiently high in places to escape flooding, but in winter time only to be reached by boat. Not a tree, not a shrub even of the meanest kind, broke the dreary monotony of its surface. Even the reeds were starved and not fine of their kind; only rushes and flags flourished at their best. Still at some early period it seems to have had attractions for our prehistoric forefathers.

On the surface, occasionally, a clean-cut, sharp, undamaged celt of the Neolithic period is picked up—and forty years ago a magnificent gold torque peeped through the turf. A farmer crossing the common at night, the moon shining, was attracted by something glittering in his way. On working it out with his knife it proved to be a gold torque in perfect condition, the metal of which was worth fifty pounds. Later on, the spot seems to have found favour in the sight of the Roman conquerors of the country, for on the elevated ridge, out of the reach of the flood water, they established a very considerable pottery, extending at intervals over a length of nearly a mile. Here the cultivator has brought to light the sites of several kilns, remains of the foreign red ware in use for patterns, or it may be domestic service, with several new names of potters not heretofore recorded, hand mills either for grinding corn or paste for the finer description of ware, polishing stones and other materials of the craft. After their departure the tract must have been abandoned to a state of nature wholly unproductive and uncared for. Much of the surrounding land is of a good quality, some of it unusually good. On the summit of the low hills to the

south, traces of early British sepulture are so marked as to lead to the conviction that some of the earliest settlements were formed there, attracted by fine springs of water and the rich fertile soil. Then followed the division of the surrounding belt into parishes with their manors and clusters of houses, seven parishes in all, immediately contiguous to the Fen which then in time became intercommonable, that is, used by the commoners of the seven parishes, and then only for the grazing of their live stock and for a supply of fuel, peat out of northern lowest portions and "turves" (slow of combustion) off the drier pasture land.

The fowling and fishing were shared, no doubt, between the poacher and the proprietors of the right; the latter, however, down to the latest times, destroying the nets of the former and harrying the interloping gunners in their pursuit of wild-fowl. Any attempts to exercise so-called public rights—such as grazing cattle from a distance, taking fuel to "foreign" homesteads, burning ashes to put on land out of the interested parishes, or squatting, or even camping as gipsies do, on this wild but not "no man's" land tract—was promptly resented and resisted. In this state of nature, then, the whole fen or common remained until the middle of the fifteenth century, when the attention of the country was directed to the removal of the flood water drowning thousands of acres and rendering them uninhabitable and profitless. The main works were undertaken and carried out by the Earl of Bedford and his associates. As a reward for their costs and exertions, portions of the districts benefited (the Great Bedford Level) were allotted to "the adventurers," and as among other larger and vastly more important works was a drain or "cut" of some miles length from Grunty Fen to the River Ouse near Littleport, a rectangular allotment of 426 acres of the highest land in the centre of the 1,776 acres of the fen was enclosed and became freehold land, but subject to a tax for the purpose of maintaining the works by which the great level of the fens had been rendered comparatively dry. A portion, however, of this 426 acres lay so low that the water had to be lifted out of it by a scoop wheel driven by a windmill.

Nothing more was done by way of relieving the fen from submersion until about the year 1838, when, in order to prevent the body of water poured into the fen from the slopes of the surrounding seven parishes from passing down the Bedford Level drain into Littleport parish, a catchwater drain or dyke was cut all round the fen at the foot of the slopes or rise, but at such a height as to allow of its discharging itself by gravitation

into the river several miles above Ely and Littleport. This work, costing 2,500*l.*, of course indirectly benefited the fen, which thenceforward received no more water than what fell in rain on its own area. It was now a common, bright with water in winter in the pools, as they were called, in the north, but only dotted with watersplashes elsewhere. There were fewer reeds, flags and rushes, but more thistles and ragweed. It was a paradise for goldfinches in the summer and fairly attractive for snipe in the winter. Great changes, however, had meanwhile been going on in the land that surrounded this fen. The seven parishes claiming rights on it had one after another, since the commencement of the century, been enclosed. Fine fields of grain and enclosures belted it in, and the contrast between the "made" land with its hedges, roads, farm premises and labourers for ever busied on it, ploughing, sowing, mowing, reaping, and the dull sulky waste below with its stunted horses and uneasy cattle for ever shifting about in hungry search for a mouthful, was most striking. It had not the varied beauty of a wild Hertfordshire or Sussex common. No encroaching crops on the edge of it (this catchwater drain barred that), with the elder hedge round the cribbed garden, the white linen drying on it, the poultry at large, the children at play, the donkey flitted hard by; beyond, the patches of gorse and ling and the scattered ponds or pits where ducks and geese thrive and busy themselves in the most perfect health.

It was obvious that this "unmade" land could not remain in its state of nature, or rather of mauled nature, for this Bedford Level drain and the catchwater drain between them had made the life of the pike precarious, and deprived the wild duck of a safe nesting-place and resort, but had left enough water to unfailingly rot the scabby sheep, and establish ague in the shepherd's home. There was to be another change, the great one; the one thousand three hundred and fifty acres were to undergo the expensive process of manufacture and be "made" land as the word is understood in old-inhabited and cultivated countries.

In order to effect this change it was necessary that all having a legal interest in the fen or common should be consulted, and that the majority should agree to the course to be adopted. The persons interested besides the owners of the 426 acres of adventurers' land, were the commoners and the landowners of the seven parishes, and under action taken by outsiders the poor of these parishes as well as the lords of manors had also to have their claims, which did not come to much, taken into account. A short record of the proceedings has come down in writing

from a landowner who, acting for himself and others, promoted the enclosure. It runs as follows :

In the autumn of the year 1857 I began to see what I could do towards the enclosure of Grunty Fen. It consisted (besides the four farms in the centre of it, comprising 425 acres allotted to the adventurers of the Bedford Level Corporation) of about 1,400 acres. Attempts and suggestions for its enclosure had been made during the past century, among others by Bentham the historian of Ely Cathedral, but they had always failed, and the enclosure had come to be looked upon as an impossibility. The fen was covered in places with anthills, and in summer with thistles which enticed large flocks of goldfinches. The portion under Witchford was swampy and was the abode of snipe, and there was rarely a day in the year on which some gunner was not in pursuit of them. The last day I ever shot on the unenclosed fen I killed thirteen couple. This portion also was dug up for "sods." No one seemed to know who had any legal rights on the fen; every one did what was right in his own mind on it. It was grazed to any amount, and people had in late years begun to dig it up and carry away the soil on to the adjoining lands. It had become a regular nuisance, and as it lay immediately under the new manor house which was built in 1847-48 I was determined the nuisance should cease. During the year 1857, therefore, I ferreted about in the records of the Court of Exchequer and in the Petty Bag Office, and ascertained what was the history of the other fens before they were enclosed. I ascertained what entries there were in the Court Rolls of the different manors adjoining the fen in regard to it, and having mastered all the facts that I could gather I arrived at the conclusion that the fen in former times, centuries ago, was precisely in the same position as the other fens in the Isle of Ely, and was part of the wastes of the adjoining manors and was in fact an inter-common.

Prospects were held out of a *pro rata* allotment to all the highlands in the parishes abutting on the fen with small common-right allotments to the houses. This secured the requisite number of assents (besides those of the lords of the manors), and an Act was obtained for the enclosure. In time a valuer was appointed to adjust the interests of those having a legal claim to participate in the division of the fen, to plan and lay out the lots, to make the public roads and watercourses, and to hand over the recovered acres to separate ownership and cultivation.

Six hundred and twenty chains, or seven miles and three quarters of public roads, 30 feet wide, metalled 12 feet wide with 3 inches of gravel on 7 inches of burnt ballast, were made. These cost, with the drains or dykes alongside them, and some other independent watercourses and outfall works, 6,286*l.* 11*s.* 2*d.*; the bridges and tunnels connected with these, 424*l.* 3*s.* 8*d.* The valuer's remuneration at 16*s.* an acre on 1,350 acres came to 1,080*l.* In addition to these the fencing and levelling the recreation allotments cost 61*l.* 14*s.* 2*d.* It will thus appear that it cost the landowners—many of them very small people—8,452*l.* 9*s.* as well as a tax of 100*l.* a year for the passage of the water to the River Cam, equal at 3 per cent. to a capital sum of 3,300*l.*, or 11,452*l.* in all, to bring the fen out of its wild state up to its first stages of recovery.

If 50 acres be deducted for public roads and watercourses

from the 1,350 acres of the fen, the remaining 1,300 acres had to bear this first cost, equal to a charge of 8*l.* 16*s.* per acre. Before, however, the allottees could bring their new possession into cultivation, the division fences had to be formed and gates put down. As planting, fencing, and rearing the quickset hedges was done at the cost of about 1*s.* a yard, and there still remained the levelling of the surface which was covered with holes and hillocks, the estimated total cost of these subsidiary operations would hardly come to less than 24*s.* an acre, bringing the cost up to 10*l.* an acre before a ploughshare could be driven through the turf or a beast be turned out to graze. In order to render a very large portion of the land fit for cultivation, under-draining remained to be done, costing in 1862 about 3*l.* an acre, but at the present time nearly double that sum.

Some of the reclaimed land is certainly of a very fine quality, but a portion would not repay the cost of cultivation, and is still almost in a wild state, though encumbered with this heavy outlay.

The seven lords of the manors had allotted among them 23a. 0r. 7p., and there was set for the poor of the seven parishes 24 acres in all of recreation ground, and no less than 237 acres of allotments subject to rent charges.

The crowning evidence of modern civilisation is seen in a railway bisecting the fen, with two stations on it, bringing London within a two and a quarter hours' run, and St. Ives market within a run of thirty-five minutes, of these stations.

It is to be hoped that the short history of the process and cost of "making" the land, entirely apart from the cultivation of it, may, with the other instances already given, help to demonstrate the fact that the farm lands of England, before the cultivator or husbandman could turn a furrow or stock an acre, had first to undergo the process of manufacture at a large outlay of enterprise, money, and labour.

This the owner exclusively incurred and provided at his own cost and charges, and acting on lines distinctly special and antecedent to the cultivator's appearance on the scene. The latter then brought fresh capital and different methods into play, but not before the landowner had manufactured the artificial area to fit it for his productive operations.

ALBERT PELLI.

Hazell each, Northampton.

SIXTH EDITION
(**TWENTY-SIXTH THOUSAND**)
OF

Elements of Agriculture

A TEXT-BOOK

PREPARED UNDER THE AUTHORITY OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

By **W. FREAM, LL.D.**

CONTENTS.

PART I.—THE SOIL.

1. ORIGIN AND PROPERTIES OF SOILS.
2. COMPOSITION AND CLASSIFICATION OF SOILS.
3. SOURCES OF LOSS AND OF GAIN TO SOILS.
4. MOISTURE IN SOILS.
5. IMPROVEMENT OF SOILS.
6. TILLAGE.
7. IMPLEMENTS FOR WORKING SOILS.
8. MANURES AND MANURING.

PART II.—THE PLANT.

9. SEEDS AND THEIR GERMINATION.
10. STRUCTURE AND FUNCTIONS OF PLANTS.
11. CULTIVATED PLANTS.
12. WEEDS.
13. SELECTION OF SEEDS.
14. IMPLEMENTS FOR SECURING CROPS.
15. GRASS LAND AND ITS MANAGEMENT.
16. FARM CROPS.
17. FUNGUS PESTS.
18. INSECT PESTS.

PART III.—THE ANIMAL.

19. STRUCTURE AND FUNCTIONS OF FARM ANIMALS.
 20. COMPOSITION OF THE ANIMAL BODY.
 21. FOODS AND FEEDING.
 22. THE ART OF BREEDING.
 23. HORSES: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 24. CATTLE: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 25. SHEEP: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 26. PIGS: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 27. THE FATTENING OF CATTLE, SHEEP, AND PIGS.
 28. DAIRYING.
- INDEX OF PLANTS.
GENERAL INDEX.

Of all Booksellers.

486 pages, with 256 Illustrations.

Price **THREE SHILLINGS AND SIXPENCE**, bound in cloth.

LONDON: JOHN MURRAY, 50A ALBEMARLE STREET, W.

PUBLICATIONS

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

QUARTERLY JOURNAL OF THE SOCIETY.

Published on March 31, June 30, September 30, and December 31; the Four Parts forming a Volume of about 1,000 pages. Price 3s. 6d. each Part.

TEXT-BOOK ON AGRICULTURE.

ELEMENTS OF AGRICULTURE: a Text-Book prepared under the authority of the Royal Agricultural Society of England by W. FREAM, LL.D. 496 pp. with 256 Illustrations. Twenty-six Thousand. Price 3s. 6d. bound in cloth.

PAMPHLETS.

PAMPHLETS BY SIR JOHN BENNET LAWES, BART.

VALUATION OF UNEXHAUSTED MANURES. By Sir JOHN BENNET LAWES, Bart., LL.D., F.R.S., and Sir J. HENRY GILBERT, LL.D., Ph.D., F.R.S. Price 6d.

TABLES FOR ESTIMATING DEAD WEIGHT AND VALUE OF CATTLE FROM LIVE WEIGHT. By Sir JOHN B. LAWES, Bart. Price 1s.

VETERINARY PAMPHLETS BY SIR GEORGE BROWN, O.B.

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS. Fourth Edition (1895). 64 pp. With Sixty Illustrations. Price 1s.

ANIMALS OF THE FARM IN HEALTH AND DISEASE. 72 pp. With 52 Illustrations. Third Edition (1895). Price 1s.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHOEING. 20 pp. Third Edition (1892). With Twelve Plates. Price 6d.

CONTAGIOUS FOOT-ROT IN SHEEP (1892). 16 pp. 8 Illustrations. Price 6d.

OTHER VETERINARY PAMPHLETS.

THE MARE AND FOAL. By Professor J. WORTLEY AXE, M.R.C.V.S. 58 pp. With Twenty Illustrations. (1898). Price 1s.

THE LAMBING PEN. By HAROLD LEESEY. 3rd Ed. (1897). With 9 Illustrations. Price 6d.

ABORTION IN CATTLE. Report of the Special Committee appointed by the Council, with Minutes of Evidence, and Appendices. 88 pp. (1894). Price 1s.

PAMPHLETS BY MR. CHARLES WHITEHEAD, F.L.S., F.G.S.

HINTS ON VEGETABLE AND FRUIT FARMING. Fourth and Enlarged Edition (1893). With Seven Illustrations. 53 pp. Price 6d.

METHODS OF PREVENTING AND CHECKING THE ATTACKS OF INSECTS AND FUNGI. With Twenty-six Illustrations (1891). 40 pp. Price 6d.

HOP CULTIVATION. With Thirteen Illustrations (1893). 48 pp. Price 1s.

DAIRY PAMPHLETS.

(Issued under the authority of the Dairy Committee of the Society.)

THE PRACTICE OF (a) CHEDDAR, (b) CHESHIRE, AND (c) STILTON CHEESE MAKING. Price 2d. each.

SIMPLE RULES FOR BUTTER MAKING. Revised May 1896. (Sheet.) Price 1d. each, or 5s. per 100. Mounted on card and varnished, to hang up in the Dairy, 6d. each. (These Rules can also be had in the Welsh Language.)

OTHER PAMPHLETS.

TECHNICAL EDUCATION IN AGRICULTURE. By W. FREAM, B.Sc., LL.D. With Two Reports by the Education Committee of the Royal Agricultural Society of England. Second Edition (1891). 24 pp. Price 6d.

THE DRYING OF FRUIT AND VEGETABLES. By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 4 Illustrations (1897). 20 pp. Price 3d.

HEDGES AND HEDGE MAKING. By W. J. MALDEN. With 10 Illustrations. (1899.) 32 pp. Price 6d.

THE MAKING OF THE LAND IN ENGLAND. By ALBERT PELL. (1899.) 27 pp. Price 6d.

EXPERIMENTS IN MAKING ENSILAGE DURING THE WET SEASON OF 1888. By the late H. KAINS-JACKSON. 64 pp. Price 6d.

COTTAGE SANITATION IN RURAL DISTRICTS. By H. MACLEAN WILSON, M.D., B.Sc. With a Preface by T. PRIDGIN TEALE, F.R.S. New and Enlarged Edition. 32 pp., 12 Illustrations (1896). Price 3d. per copy; 2s. per doz.; 12s. 6d. per 100.

LIST OF GOVERNORS AND MEMBERS OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND. Corrected to 31st December, 1898. 136 pp. Price 2s. 6d. for Members; 5s. for Non-Members.

The above can be obtained at the Society's House, 13 Hanover Square, London, W.; or of Mr. JOHN MURRAY, 50a Albemarle Street, W.

COLOURED DIAGRAMS.

(Obtainable from Messrs. W. & A. K. Johnston, 5 White Hart Street, Warwick Lane, E.C., or Edinburgh.)

THIRTY DIAGRAMS OF INJURIOUS INSECTS. Drawn from Nature by the late Miss GEORGINA E. ORMEROD, in conjunction with Miss ELEANOR A. ORMEROD, F.R. Met. Soc.

Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d. Sets of Six, 7s. 6d.; or varnished and mounted, 12s. 6d.

EIGHT DIAGRAMS REPRESENTING THE LIFE HISTORY OF THE WHEAT PLANT (after FRANCIS BAUER). With Explanatory Pamphlet by W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet) 10s. per Set of Eight Diagrams.

THE POTATO DISEASE. By W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

HEDGES
AND
HEDGE - MAKING.

BY
W. J. MALDEN.

WITH TEN ILLUSTRATIONS.

LONDON :
JOHN MURRAY, ALBEMARLE STREET.
1899.

HEDGES
AND
HEDGE - MAKING.

BY
W. J. MALDEN

WITH TEN ILLUSTRATIONS.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1899.

SUMMARY OF CONTENTS.

	PAGE
I. THE FORMATION OF HEDGES	3-21
Characters Desirable in a Plant for Hedging Purposes	3
Properties of Whitethorn	4
Banks in conjunction with Hedges	5
Ditches in conjunction with Hedges	6
Midland Railway Hedges	7
The Duke of Bedford's Fen Hedges	7
Leicestershire " Bullfinches "	8
Preparation of the Bed	9
Raising Plants	11
Planting	14
Protection and Shelter for Young Hedges	17
Cleaning Young Hedges	18
Training Hedges	19
II. THE PRESERVATION AND RESTORATION OF OLD HEDGES	21-29
The Preservation of Established Hedges	21
A Scotch Method of Trimming	22
Cutting back to the Stem	23
Layering or Laying Hedges	25
III. HEDGES NOT OF WHITETHORN	29-32
Other Plants suitable for forming Hedges	29
Evergreen Hedges	31

HEDGES AND HEDGE-MAKING.

FROM all one can learn Hedges have always been more or less subject to neglect, and it is not surprising that they should be particularly so at a time when, with all care in matters of expenditure, the returns from farming are small in comparison with the outlay. There was never a period when economy was more necessary, and a saving in any direction, where it can reasonably be effected, has become imperative. As it is only in rare instances that any direct pecuniary return can be looked for from hedges, it is but natural that their preservation should be among the first of the many operations on the farm to be neglected. It is, however, doubtful economy, for a stick in time may save nine; and when once a weakness commences in a hedge it very soon increases until it becomes a gap, and a gappy hedge no longer performs its first duty of being a fence. To produce a hedge which is a reliable fence is a matter of considerable expense, but once obtained it is not expensive, considering the responsibility placed on it, to maintain it. A reasonable quantity of fencing is as essential to the proper working of a farm as is the homestead itself. In respect to the necessary expenditure in the maintenance of hedges there is one point which tends to minimise the seriousness of the outlay in labour, and that is that the work may be performed at a time when there is little else of importance to be done on the farm, consequently good labourers may be kept in employ during periods of slackness, so that their services are secured at times when they are necessary and valuable. This feature alone should practically do away with the excuse for neglecting to keep hedges in a thriving and efficient manner.

It is not intended here to deal so much with ornamental fences as with those of practical utility to the farm. From the adaptability of the whitethorn (*Crataegus Oxyacantha*) to the formation of efficient fences in all but the stoniest and most exposed situations, chief attention will be bestowed upon it.

I.—THE FORMATION OF HEDGES.

CHARACTERS DESIRABLE IN A PLANT FOR HEDGING PURPOSES.

The suitability of a plant for the purpose of making a quick or living hedge so as to form a fence against cattle is determined by a number of features, the most important of which are that it should: (1) produce a hedge in a reasonably short time; (2) be long-lived; (3) be capable of easy repair if neglected; (4) be

uniform in growth; (5) be easily kept within suitable bounds; (6) present as a hedge a compact front; (7) be strong enough to resist the efforts of animals to escape, in which it is greatly assisted by having thorns or other strong prickles; (8) be easily raised, so that the expense of the young plants may be small; (9) be adapted to the soil on which it is planted; (10) be little injured by frost, even in seasons of exceptional severity; (11) afford shelter to animals from cold winds; (12) have a tendency to produce shoots near to the ground so that it will enclose small as well as large animals; (13) afford little harbourage for insects; (14) be little susceptible to fungal and other diseases; (15) not possess stoloniferous roots which are apt to grow out into the adjoining pastures or fields; (16) not be too readily eaten by animals, either in the branches or shoots by cattle, or in the stems by ground game; (17) when old permit the stump or stool to be kept small or near the surface so as to throw up young wood of suitable size to maintain a hedge.

PROPERTIES OF WHITETHORN.

No plant possesses so many of these desirable features as the whitethorn, in which all of them are well represented. Some years are required to produce a whitethorn hedge fit to hold back gadding cattle, as will be seen hereafter from the information kindly supplied by gentlemen responsible for some of the longest and best kept systems of hedges in the country, though ordinary fences may be obtained in far less time. A whitethorn hedge is long-lived, and properly tended will be vigorous at the end of a century. The hedge is easily kept within bounds, and presents a uniform and compact appearance; being armed with stout short thorns, animals do not readily eat any but the young shoots, and hesitate to force their way through. Except when it is very young, frost and winds do little injury, while the whitethorn tree may be seen thriving in the bleakest places, throwing out its white blossoms in profusion after the sharpest winters. It sheds its leaves in autumn, therefore it does not provide the protection in the winter that the beech, which retains a large portion of its leaves, affords; at the same time winter grazing is limited to comparatively a small extent of the pasture land. Moreover, a thick whitethorn hedge is sufficiently dense to break the force of the wind to a greater extent than might be supposed. As to the other features mentioned as being desirable, they are well represented, while the undesirable ones are wanting.

In short, it may be taken as a fairly accurate statement that whitethorn is the best hedge where good fences must be kept;

and the fact that it is practically the only plant used for fencing along the sides of the railways running from the extreme north of England to the south, passing through a great variety of soils, and existing in climates differing greatly in respect to rainfall, frost, and elevation, is perhaps as good evidence as could be desired of the wide adaptability it possesses. On exceedingly thin soils whitethorn may not find sufficient nutriment to grow vigorously; while at very high elevations it is difficult to establish, as the young plants are affected by bleak situations, though if protection is afforded during the early years so that it gets a thorough start, and the wood becomes hardened, it is very hardy. On very wet soils, it is true, it becomes liable to lichenous growths, but this can be avoided by drainage. Open ditches are preferable, as pipe drains are liable to be choked by rootlets. Occasionally open ditches are inconvenient, and under-drainage has to be resorted to. Where practicable the ditch should be placed on the upper side, so as to cut off the water.

BANKS IN CONJUNCTION WITH HEDGES.

Considering the large number of hedges found on high raised banks it may seem somewhat arbitrary to say that high narrow banks should not be employed, but an inspection of hedges grown under these conditions proves the advantage of planting on the level, or at any rate on only slightly raised flat beds. Of course the bank has the advantage of forming part of the fence, and making a fence sooner than when a hedge is planted on the flat, but the permanency of a fence when raised and the expense which is inseparable from that of establishing a quick hedge must not be lost sight of. Those who plant sometimes look to immediate results rather than to lasting ones. The fences are the property of the landlord, and the tenant is responsible in most instances for their repair. One need only look at the fences one passes by to see how lightly the importance of good fences is regarded by both parties. In some districts much of the planting has been undertaken by the tenants, who have received more or less assistance from the landlord. As the tenant's interest ceases with his tenancy, it is not surprising, where conditions are not laid down, that he should plant in such a manner as will secure results within the shortest time. As the bank helps him, he naturally adopts it.

Where fencing is undertaken by the estate it is decidedly preferable to hold in chief regard the permanent features, therefore planting on the flat is most desirable. Such is the practice on the great railway systems, which may safely be regarded as the

estates on which the art of fencing is best understood and best carried out. In fact we owe a debt to the railway companies for the excellent object lesson they have set us throughout the length and breadth of the land, and I am much indebted to the kindness and courtesy of Mr. McDonald, of the Chief Engineer's Department of the Midland Railway, for the valuable details of the system of hedging carried out under his superintendence which are summarized on p. 7. No one could have travelled on that railway without noticing mile after mile, in whatever district he might be passing through, of closely contained, neat, rigid and effective hedges by which the track was protected. Those who travel must also notice that these hedges are planted on flat beds, and not on raised banks. Ditches are used only where necessary for drainage purposes, but shallow grips are maintained in some instances to keep the cattle from "breasting" the hedgings.

DITCHES IN CONJUNCTION WITH HEDGES.

Ditches in conjunction with hedges add to the efficiency of fences, provided the hedges are placed in a proper position; they are also useful and in some cases necessary for drainage purposes. If, however, the hedge is badly placed, that is, too near the edge of the ditch, in course of time the earth falls away, leaving the roots bared, with the result that it is difficult to keep the bottom of the hedge compact. No matter what form a hedge is designed to keep, its usefulness, and the length of its life as a fence, depend on the density of the bottom growth. In fact, a big-topped hedge with weakness below is as much a mistake as a big-topped horse with uncertain legs; and as the value of the horse ultimately is regulated by his feet and legs, so is that of a hedge by its bottom. When the hedge is placed too near the edge of the ditch it is liable to suffer in the same way as one placed on a narrow raised bank, by the washing away of soil from the roots; and although the earth from time to time taken out of the bottom of the ditch when laid on them makes a partial remedy, it is not a complete one. Much of the mischief, however, is caused by making the sides of the ditch too vertical in the desire to save space, but the saving need not be great, as the hedge may be grown chiefly on the ditch side, getting the required thickness without spreading far into the field. These points are referred to subsequently when describing the method of making a hedge and a ditch; it is better to deal more fully first with the flat bed system, as there are many points in common, and when treating of the ditch attention can be chiefly directed to features to be avoided.

MIDLAND RAILWAY HEDGES.

The various points to be observed in hedge-making are well indicated in the subjoined summary of the answers to my inquiries. Attention has been called to the Midland Railway Company's hedges, and the particulars of management given here cannot fail to be of interest.

Mr. McDonald prefers double rows planted in parallel lines, the lines 4 inches apart, and the plants 8 inches from one to the other in the rows. The planting is done so that one row breaks joint with the other:

There are about 190 plants to the chain. Three-year-old quicks are purchased, costing usually 11s. per thousand. Whitethorn is generally used. The cost of preparing the beds is about 2s. per chain, but varies with conditions. The cost of planting is 1s. per chain, and during the first few years the cleaning costs about 1s. per annum. The stout, five-rail, post and rail fences cost 2s. 3d. per yard. The quicks are cut back at planting, and are left untrimmed until they attain a height of from 6 feet to 8 feet, when they are layered. The cost of layering is about 3s. per chain. Live stakes are left every 2 feet; the layers are cut close to the ground and are wattled between the stakes at an angle of about 40°—laying them uphill if the ground is not level. The railway side is trimmed, the field side being left untrimmed. The trimming of the hedges, subsequently, is done late in summer or early in autumn, and costs 6d. per chain.

THE DUKE OF BEDFORD'S FEN HEDGES.

A description of another method of raising hedges, as carried out on the Duke of Bedford's fen estates, was kindly supplied me through Mr. Brodie, of the Thorney offices. I have personal experience extending over many years of the excellent manner in which these hedges are managed. The drainage of the fens and the consequent fresh laying out of the roads and farms within comparatively recent years necessitated a large amount of fencing, while in the flat and somewhat bleak district shelter from the cold winds is highly advantageous. The fences are therefore to a great extent such as have been raised within the past forty years, and the work of planting has been continued up to the present. In the parish of Thorney, some 18,000 acres, there is not a weak piece of hedging, but mile after mile of dense, bushy, well-contained fences without a gap may be seen, bearing testimony to the excellence of the management.

The bed is dug and cleaned to a width of 4 feet 6 inches; 18 inches, forming the root bed, is dug to a depth of 2 feet, and the portions on the outside of this 1 foot deep. It is regarded as essential that the beds be prepared at least a month before planting; the latter is usually done in November, but may be continued up to March. Nothing but whitethorn is used, and all the plants are purchased. Single-row planting is preferred, the quicks being set 4 inches apart. In April, after planting, the quicks are cut back to a height of 3 inches above ground. At three years the hedges are

cut into the desired shape, and subsequently are kept in shape by annual trimming. In cases where the old hedges require cutting down, layering is preferred to merely cutting down to the ground. On grass land, post and rail fences, costing 25s. to 30s. per chain, or post and wire, with top-rail, costing 20s. per chain, are found most suitable. On arable land, post and wire fences, costing 15s. per chain, are employed.

LEICESTERSHIRE "BULLFINCHES."

The Leicestershire "bullfinches" are of world-wide repute, and have proved as effectual in holding back cattle as checking the career of any but the best mounted huntsmen. As big cattle are grazed on the Leicestershire pastures, and they lie in adjoining fields with a natural tendency to try to get together, strong fences are a necessity. Mr. John Harrison, of the well-known agricultural seed firm of Leicester, whose business associations make him well acquainted with the customs of the district, has kindly sent me the following account of the methods adopted. Many of these fences are very old, but they are maintained in a vigorous condition by the practices in vogue, and are well worth the attention of those whose fences have become overgrown or out of repair.

In this and adjoining counties, especially on the heavy soils where bullocks are grazed, strong thick fences are required. To prepare for them the ditch is cut about three feet wide and two feet deep, raising a bank about a foot high. It is composed of the turf turned in green part downwards, covered with several inches of fine soil, obtained from the bottom of the newly formed ditch. In this bank the quick or whitethorn is planted by cutting out the lines and placing each set about nine inches apart in two parallel rows, the same distance apart. The age of the quick is generally two-years' seedlings which have been transplanted in nursery rows and stood there two years longer; this process insures plenty of short fibrous roots near the surface, and stiffens the stems, from which the young growth is made when cut down to about three inches from the surface of the soil. They are then allowed to grow up six to eight feet high, which takes, in most cases, about five years to accomplish—ready for cutting and layering, commonly called laying. During the whole of this time the new fence is protected by a "post and rail" fence on one or both sides, according as the land adjoining is arable or not, as the young hedge must be protected from the cattle, and be allowed free and undisturbed growth.

The process of layering is done any time during the winter by cutting off the back row, or that on the land side, about three feet from the ground, selecting the strongest rods, trimming them and leaving them about two feet apart to act as stays, through which the full length of the front row is drawn down and interlaced to secure them from springing upwards, and causing them to remain in the position in which they are placed. The layers must be split a little more than half through, about nine inches from the ground, on the side opposite to the direction of laying, and be wattled in at an angle of about 30° from the ground. By selecting the best of these and turning the brush or thorny parts towards the land and away from the ditch, a very strong and well-bound fence can be secured, all superfluous thorn parts being cut away, to leave the whole mass even and regular. These

will produce fresh growth in both rows, and grow up between the layers and further strengthen the whole living mass. In the old fences when plants have died through old age or other cause, stakes of ash, thorn, elm, and any other available kind of timber (except willow or elder) may be used as stays, and in such cases, the layers of old hedges sometimes being few in number, it is necessary to take great care not to cut away any that might be required, and to make up for such deficiency as occurs by inserting dead wattles. The ditches are then filled with the surplus cutting of thorn, which keeps the cattle out and helps to protect the young growth of the fence. The object of placing the brush or thorny extremities of the layers on the land side is to form a wall against the stock. The brush and wattle are bound carefully along the top, with a binder made by interlacing long strips of young hazelwood or brambles, from stake to stake.

Fences on the arable land, which are kept much smaller, are usually planted in single rows six inches apart, cut by a splasher twice a year, and are not often allowed to grow more than about four feet high. They are occasionally layered, and frequently have a small ditch cut on one side. On well-managed farms most hedges are splashed about the month of August, just before harvest, to keep them compact and bushy, after the manner of the railway companies, who have the best examples.

A perusal of the accounts given above will show that they describe three different methods of hedge-making. In the first the quicks are set in double lines, and after a few years' growth the hedge is laid. In the second a single row of quicks is planted, and the hedge is trained into shape by annually cutting it back into the required form, inducing a particularly dense growth of thorn, thus providing shelter for animals as well as acting as a fence; whereas the railway companies have as a first object the protection of their track from the incursion of animals, though from their well-trimmed shape the hedges would act as effective shelters from wind. In the third Mr. Harrison gives a description of the Leicestershire methods of planting on grass and on arable land, together with the treatment of older hedges, as carried out by farmers with so much success. All these possess features of value to the farm and estate.

PREPARATION OF THE BED.

A highly important item in the formation of hedges lies in the preparation of the bed. Discarding, as out of date and not best suited to the formation of a permanent hedge, the highly raised bank, and giving attention to those hedges formed on low flat beds, the method recommended in the account of the Thorney hedges of digging and cleaning a track about 4 feet 6 inches wide, of which 3 feet are dug to the depth of a foot, while the middle 18 inches are trenched to the depth of 2 feet, is adaptable to practically all soils and most situations, and need be little enlarged upon. The feature of cleaning is, however, one that should not be overlooked, as the future work of keeping

it free from weeds is greatly lightened thereby, and it is obviously more easy to clean the land when fallow than when cropped by the young hedge. One point in connection with the preparation of the soil is maintained by all hedge-makers, and that is that it is most essential that the land be worked and the bed prepared some time before planting, so that the soil may lie under the mellowing influence of the weather at least a month, and preferably longer. This work requires to be done in autumn, and if sufficiently long prepared planting may be proceeded with in November, for although there is practically no growth the soil settles nicely about the roots and the rootlets strike readily into it, at once finding sustenance when spring growth is made.

A striking instance of the advantage of trenching, even though no manure was dug in, came under my notice a few years since. About five chains in the middle of a hedge some twenty chains in length was not trenched, as the work was hindered by a long winter frost; the soil being a light loam on a gravel subsoil it was supposed that in all probability it would not make a great deal of difference. The hedge grew well until about the fifth year, when it showed signs of weakness, and after a time patches of a reddish-brown fungus appeared; the disease spread throughout the whole untrenched length, and in the course of two years utterly destroyed it. The stumps were taken out, the ground trenched and exposed, and fresh plants were put in. It is about ten years since it was replanted, and it is now in a healthy and thriving state. The other part, which was trenched in the first instance, never looked back, and is now a stout fence from which the protecting rails have been removed. This may be an exceptional case, but there is no doubt that the failing of the hedge predisposed it to disease; although before disease showed itself it looked like dying. Good hedges have been obtained from untrenched beds, but experience is strongly in favour of trenching. Rich soils, with free subsoils, are least likely to be benefited by trenching, as the plants grow more robustly on them than on poorer soils.

Planting on sites of old worn-out hedges is rarely attended with success unless the soil is moved or re-made. As fences are frequently placed on boundaries, and one may not remove a neighbour's landmark, fences must necessarily be placed on old sites sometimes. When the old hedgerow is stubbed or stumped up the earth requires to be laid on one side, and a wide, deep, new bed made from the adjoining soil, the earth from the old bed being put back to fill in the hole made. It is advisable to trench in dung with the new earth, as the old hedge having

cropped the land for a long period has exhausted a large amount of nourishment from the soil. There is no actual evidence that there is an accumulation of injurious matter from the old hedge, though it is usually presumed that there is ; but experience shows it is necessary to remove the upper portion of the soil. If the new soil is obtained within reach of a spade-throw it will be sufficiently fresh, and it is not necessary to go to the further expense of carting from a distance. A quick hedge is a narrow belt of trees kept from spreading too widely and from attaining too great height, but a considerable amount of growth takes place annually, calling upon the land on which it stands for sustenance. For some years the roots remain within a limited space, and it is specially necessary to provide a supply of plant-food near. It has, therefore, been found desirable to trench in some long manure to supply food. Well-rotted manure yields its nourishment quickly, and it is better that it should be extended over a longer period, as too rapid a growth does not tend to the bushy development of the hedge. On thin and barren soils well-rotted turf or sod trenched in is very useful, increasing the depth of the bed, and supplying a constant amount of food for a lengthened period. I am not aware of any exact trials with artificial manures, though there seems no reason why they should not be of practical value, but highly concentrated and soluble nitrogenous manures, if applied liberally, would in all probability conduce to over-rapid growth for a time. If such are employed, only small quantities should be used. Phosphatic and potassic manures could do little harm, and might be highly beneficial.

The discovery of the effect of the nodular bacteria on leguminous plants throws light on the cause of furze or gorse thriving on soils deficient in nitrogen for the production of non-leguminous plants, and there seems no reason why the knowledge should not be turned to useful account on poor soils.

RAISING PLANTS.

The young whitethorn plants or quicks are raised from the haws of the hawthorn, and it would be possible to obtain a hedge directly by planting the haws and allowing them to grow up ; but there are many points against this, the chief of which are that longer time is required to obtain a hedge, consequently cleaning has to be persisted in for a longer time and protecting fences are required for a longer period, while the plants themselves do not grow so sturdily. It is far better to raise the plants in nurseries, allowing them to remain in the beds for two

years, after which to transplant them into lines to acquire a more bushy habit of growth, and to develop a good supply of fibrous rootlets near the surface. As the plants cost to purchase from 10s. to 25s. per thousand, it is often found convenient to grow them on the estate, though on large estates where great quantities are required the power to buy at wholesale prices, and the selection of good plants which such large customers are enabled to command, make it practically as profitable to buy as to raise; for, though the cost of raising a thousand plants need not amount to 10s., the advantage of choice from a large number and so securing uniformity is a matter of considerable importance. On less extensive estates, where a smaller quantity is used and the higher price has to be paid, there is such wide margin for profit that it is more economical to raise them. The haws or seeds are slow to germinate, in fact not until a year the following spring from the time of ripening. They should be gathered in October from robust, well-thorned bushes, preferably from bushes not too old nor too young. Several methods are adopted to prepare and preserve the seeds for planting, one of the most simple, and at the same time effective, being to dig a trench a foot deep, placing a layer of straw at the bottom, then to place a layer of haws six inches in depth, as if deeper they may heat and injure the vitality of the germ; these should be covered by another layer of straw, which in its turn should be covered with earth. After lying until a year the next February, when the skin will have left the seed clear, the contents of the trench should be sifted to separate the seeds, which should then be planted.

Another very good method is, after gathering, to spread the haws on a dry floor for five or six weeks, then to soak them in tubs of water, when the skin will be easily detached by rubbing through the hands with sand, after which they should be laid on an airy floor until quite dry. Then mix the seeds with an equal bulk of fine, dry, sandy mould, and place them against a southern wall, covering them with dry mould to the depth of four or five inches. It is advisable to turn them occasionally, and a year the following February to sift out the earth and plant them.

Occasionally nature's method of passing them through birds to take off the skin and fleshy parts is adopted, by feeding them to fowls kept in an enclosure. The droppings containing the seeds are collected, and set aside until a year the following spring, being occasionally turned to prevent heating. The seed together with the manure is sometimes sown, but this may tend to irregular distribution of seed; it is better to sift out

the seed, which, owing to the shortness of the fowl's dung, is not difficult, and to sow at the desired thickness, the manure being sprinkled on the land if it is thought to require it.

The land should be light, friable, well-drained, and not too rich, and though trenching is desirable, when making the bed it is well to keep the manure near the surface to induce the formation of rootlets there rather than at a lower depth, for such plants are easier to move, more readily strike again, and are of a more bushy habit of growth.

A perfectly fine and well-prepared seed bed is necessary. The seed is sometimes sown broadcast, but this adds to the difficulty of cleaning, and it is better to place it in drills from ten to sixteen inches apart.

In some cases the drill rows are scratched out with a hoe, and in others depressions are made by means of treading boards. When treading boards are used, a plank the length of the width of the bed and two feet to three feet wide to suit the width of rows is employed. On the under side narrow pieces of wood running the length of the plank are nailed at the distance apart at which the rows are required. The weight of the workman makes depressions slightly under three-quarters of an inch in depth, being prevented from sinking deeper by the plank. If a long bed is being planted, and the rows are required lengthwise, it is preferable to work with two such planks, the workman taking up one and placing it at the end of the other. The advantages claimed for this system are that the seed is placed in a firm seed-row, while the surface generally is left light. The workman kneels on the board and strains the seed along the drills, lightly covering it with earth. The surface subsequently should be kept light and free from weeds by hoeing.

When broadcasting is preferred, the land should be well and finely prepared, and then be divided into beds three and a half feet in width, with narrow paths between, to avoid the necessity of walking on the sown portions. Sow the seed evenly, if possible, so that the plants will come up about an inch apart; then pat the ground firmly with the back of a spade. Previously to seeding a small quantity of mould should have been raked on to the pathways, and this should now be raked back, so as to cover the seeds to the depth of an inch or an inch and a half.

When the plants sown broadcast are a year old the stronger ones should be drawn out, and after cutting the tap-root to promote the growth of bushy rootlets near the surface, and also shortening the tops to about two to three inches in length, planted again in rows a foot apart, and the plants four inches from each other in the rows. Where sown in drills, and clearing is

rendered easier than when they are sown broadcast, this first transplanting is often dispensed with. They may remain two years in the first lines, at the end of which they require to be taken up and planted in lines eighteen inches apart, and six inches from plant to plant in the rows, after having again shortened the tap-root and cut the tops down to within four or five inches from the ground. This is best done in October or February. The plants can remain in the rows one or two years, in accordance with the growth made; usually it is better to leave them two years, when they are known as two years' transplanted seedlings. The value of the plant, though commonly regarded in accordance with the strength of the stem, is, for the practical purposes of planting, greatest as the rootlets are most developed and best retained when lifted and in readiness to be planted to form the hedge, because without an ample supply of rootlets the establishing of the hedge is slow, particularly when planting is followed by a dry period.

Quick can be raised from cuttings from the roots, but although there may be a gain in time when in the land, the cost of getting is greater, while the root growth is much more irregular, and not so convenient to handle. The results obtained from seedlings are far preferable, and few hedgers of experience would use root-raised plants where seedlings were obtainable.

PLANTING.

Opinions differ as to the advantages of planting in single lines or in double rows, and as excellent hedges are obtained under either system it is not a matter of essential importance, the chief point being that with double rows greater variety in the systems of laying to strengthen or renovate are possible, and it is highly important to regard the features which affect the length of useful life of the hedge. Whichever is adopted, the number of plants per yard is about the same. I have a personal preference for planting in rows eight inches apart, and the plants placed eight inches apart in the rows, "breaking joint," so that there is practically a plant at each four inches in line; and find no special difficulty in the matter of cleaning, as the hoe can be used diagonally through the rows, and so round the plants during the time they are young or cannot smother the weed growth. This is not in accordance with the views of many hedgers, but when plants are placed four inches apart in single row, and the plants are half an inch in diameter, there is a space of only three inches from plant to plant, and it is difficult to work even so small a hoe as one with a two-inch

blade without cutting the bark. When rows are placed four inches apart, of course a hoe cannot be used with so much freedom. However, either is sufficiently good for ordinary purposes, therefore it is advisable to think rather of the length of life of the hedge than of the very near future. If a hedge planted in single row with plants four inches apart be examined after the hedge has attained maturity, it will be seen that many of the stems have attained mastery over those alongside, and have either killed them or rendered growth insignificant. Close planting tends to make plants draw upwards, and the spaces between the lateral shoots near the base are lengthened thereby. As many good authorities on hedging advocate different distances between the plants in accordance with the size of the plants at the time of planting, it is probable that thick planting is done rather with the view of securing an impenetrable fence in the early stages of growth than when it is matured. Personal experience is rather in favour of not too thick planting and the encouragement of lateral growths, but not to the extent of leaving the rods so far apart that if denuded of laterals the animals they are intended to keep within bounds would be able to force their way between. In districts where hares and rabbits are numerous close planting to prevent frequent bottom gaps is advantageous, though, as every gap is a source of weakness, it is very difficult to maintain perfect fences where there is much ground game. An advantage is obtained in respect of the damage done by ground game by the strength of the quicks when planted, as stronger quicks have better powers of resistance. Quicks which have stood in the lines for more than three years are apt to be too big; those an inch to an inch and a half in circumference are sufficiently strong for all ordinary purposes, while those larger are not so ready to establish themselves unless particularly well provided with root fibres, and though they may present a stronger appearance at first, do not seem to make relative progress, and the younger often become an efficient fence in less time.

When planting, so long as it comes within the range of a cabbage or a timber tree, it is important to place the roots in the ground in such a manner as will encourage growth. Over-deep planting is the source of many failures, and quicks are injured by being planted too deeply. Freedom should be allowed for the roots to spread, and the conditions most favourable are secured by opening a trench with a spade sufficiently wide and deep to contain the roots, after which the earth should be replaced, and trodden in sufficiently firmly to keep the plants in place. The nick should be cut with a spade guided by a

gardener's line. When planted, the quicks should be cut off to a uniform height, about two to three inches above ground, as the roots, having received a check, cannot supply sap to give vigour to the whole plant, and bushy growth is induced near the bottom. Planting is then complete, and subsequent work will consist of keeping clean the soil about the plants, and trimming to maintain bottom growth, although, in most instances, it is necessary to protect the young hedge from cattle or other animals that may be grazing alongside.

Fig. 1 shows a usual form of laying out and planting on a flat bed. It is important to leave sufficient room between the fence and the hedge for the workman to work freely. It is very common to see instances where the space is so cramped that it is almost impossible to clean properly. The small grips or ditches at the side are not absolutely necessary, but they add greatly to the efficiency of the rail fence, and in course of years

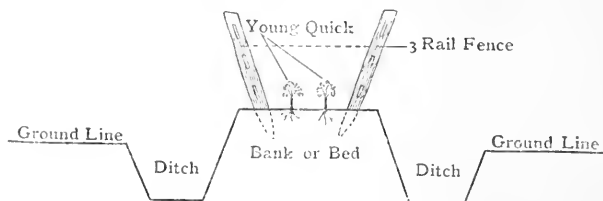


FIG. 1.—Section of Young Quick-set Fence.

gradually fill in; they are effective because animals cannot "breast" the hedge, that is they cannot apply their weight to it as their feet, being lower than under ordinary circumstances, have a downward thrust, and cannot be brought to bear in a forward direction. The grips should be placed sufficiently near to the fence to prevent bullocks from placing their feet on the bank, thus being able to apply their weight. All hedges are strengthened by such grips, though on arable land where no stock is kept they are of course unnecessary. A three-rail fence is sufficient for sheep and cattle; but where cattle only are to be restrained two rails are enough. Where larch poles are convenient mortising is not necessary, as they may be nailed on to the post; of course nailing them on the outside, otherwise all the strain has to be sustained by the nails, no help being afforded by the posts.

After long periods of dry weather, when ditches have contained little water for a number of years, there is a tendency to fill them in, as they do not seem worth the space they occupy. A return to wet seasons, however, shows that a mistake

has been made, consequently their value beyond their usefulness as fences is learned when only too late. The filling-in of ditches and the planting of hedges on their sites should therefore be done cautiously. Open ditches are the best drains, provided they are kept well cleaned out, but unless they are required for drainage purposes they should not be made in conjunction with hedges; the shallow grips already described supply all needs. Those who simply cut their hedges down to the stump, so that there is practically no hedge left for two or three years, instead of laying them, may place special value on them as means of fencing, but they are not otherwise worth the expense of maintenance. Where they are required because of the weakness of the hedge, it is generally due to the fact that the hedge became weak because of their presence. A hedge and ditch may be worked together in such a way as not to tend to the weakening of the hedge, but planting too near to the edge of the ditch is a frequent and fatal error. Too great weight of earth thrown out of ditches when laid near to the edge tends to make the sides give way, consequently it is better to throw the earth some distance back, so that it shelves back towards the field, a table being left for planting near the ditch. The angle of repose varies, of course, with the nature of the soil, but it is noticeable that the sides are in almost all instances too nearly vertical. Instead of making a horizontal table the surface may be made to incline gradually, the slight incline not acting injuriously to the hedge. This is useful where cattle are to be kept on both sides of the hedge, as a shallow grip may be placed on the field side. When planting the quicks they should be placed well away from the ditch. The object of saving ground by planting close to the ditch is not of importance, as the hedge may be induced to grow chiefly towards the ditch side.

PROTECTION AND SHELTER FOR YOUNG HEDGES.

In some districts, particularly in Ireland, which is notorious for its ill-kept hedges, the planting is done actually on the shelving side of the bank, so that in course of time, unless special care is bestowed upon it, the roots become denuded, and weeds grow in among them, tending to the early decay of the fence. The only excusable feature is that some shelter against wind is afforded to the young quick. The practice, however, is not followed merely in exposed situations. It is better to provide independent shelter if it is required, but this is only rarely needed, protection against animals being in almost all cases sufficient. A sod bank at the side of the

prevailing winds may be raised as cheaply as the ordinary bank, and will guard the young plants until such time as they have got sufficient strength to resist atmospheric influences. It is not necessary to build a high bank, and if it is required for retaining animals a single-rail fence may be placed on it; by the time the rail fence decays the hedge will be able to take care of itself. A dead hedge of wattled wood provides good shelter, and where it is available is a cheap form of temporary fence and shelter. In stone districts a wall may be made for sheltering a young hedge, but with plenty of stone available an efficient permanent fence may be made, possessing in point of shelter from cold, economy of space, and permanency, advantages not obtainable from hedges.

In respect to the cost of post and rail fences for protecting young hedges, the prices already mentioned in the description of the Midland Railway Company and of the Thorney Estate experience afford good illustration in cases where sound work is at command. Lighter and less expensive pole fences may be put up at smaller cost, depending generally on the convenience for the supply of larch poles, though, owing to the depression in hop-growing, ash and chestnut, which are suitable for the purpose, may be bought at a small cost. For bullock-fencing barbed wire is very effective and cheap, as a top strand of barbed wire prevents the animals from breasting the fence, and few supports are necessary as compared with other forms of fencing, and where wood is scarce it is frequently used. Great inconvenience and danger are caused by wire in a hunting country, but hunts generally now make terms with farmers by which the trouble is overcome.

CLEANING YOUNG HEDGES.

The prosperity of a hedge when once planted depends very much on the thoroughness with which weeds are kept down. Very sturdy hedges, and those where the grass is cropped closely to them, may smother out weed growths for even a long time; but a young hedge is much at the mercy of the weeds if they are allowed to grow unrestrained. During early years a strong Dutch hoe may be used with great advantage on the freshly dug bed; subsequently the fork is of more benefit, the light stirring about the stems a spit or two wide encouraging the root growth; when the hedge is older, and the rootlets have gone further afield for their nourishment, shallow digging with a spade is more expeditious. After this an inspection will show what is the best mode to adopt, and provided the bottom is very

dense, so that weed growth is smothered, nothing more than an occasional brush with a fagging-hook may be necessary. Brushing out should be done early enough in the season, as not only is it more beneficial for the hedge, but insects and injurious fungi are thus deprived of harbourage.

TRAINING HEDGES.

The systems of management before alluded to as carried out on the Thorney Estate and on the Midland Railway deal with two widely different but excellent methods of training a young hedge; they are representative of the two main systems, the first, of training a hedge into shape without laying, and the second, of laying a hedge into shape. It is a very general practice to cut back the growth after two or three years, leaving only three or four inches of stump, subsequently training into shape; on the Thorney Estate, however, the hedges receive the best attention from the first, and lateral bottom growth is encouraged, so that it is possible to commence shaping at three years at a height of eighteen inches. The closeness of the cutting is regulated by the nature of the growth, and an extraordinary denseness is obtained. The illustration (fig. 2) represents the best shape into which a hedge may be trained.

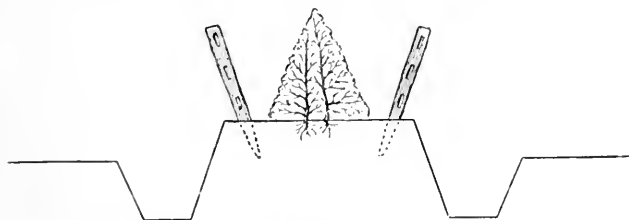


FIG. 2.—Section of Quick-set Hedge, to show triangular shape.

For general purposes the triangular hog-maned hedge, with broad base, is best. Where a high, narrow hedge is required, more particularly as a shield from wind, as around an orchard, straight vertical sides may be more suitable, but where a hedge is required as a fence against cattle, the triangular form is undoubtedly best. The chief reasons for this are that whitethorn shoots are seriously affected by the shade of portions above them, and from the wet dripping on to them; also because the value of a fence for enclosing animals of all sizes depends rather on the density of the bottom than on the height—a hedge weak at the bottom rapidly weakens; also because a large quantity of lateral shoots attract sap, and thus prevent excessive flow to the upper shoots, to which there is great tendency.

The Midland Railway Company's method is one of making a hedge to shape rather than growing it to shape. In the first instance, the hedge is allowed to grow to the height of six or eight feet, and is then wattled at an angle of about forty degrees, stakes being left at about two feet apart, the wattling rods being hacked close to the ground, and woven in between the living stakes. From observation, I am able to speak of the regularity of the wattling and its rigidity. The hacking of the stem causes a strong growth of young shoots at the base, which go to form the bottom of the hedge, and the upward flow of the sap is arrested sufficiently to prevent over-growth at the top, while allowing sufficient to go up to maintain it in a healthy state. The wattling makes the hedge practically impassable to animals. In course of time the hedge assumes under the plashing-bill the triangular shape, but with a somewhat narrow base.

Any other methods in practice which are worthy of adoption are merely adaptations of the foregoing with slight modifications. All good methods are comprised in those which tend to the encouragement of bottom growth. Addition to the height can always be secured in a short time if desired.

The trimming of whitethorn hedges is best effected by the plashing or splashing bill, used with an upward stroke. The shears are tedious, and do not give a better face than the bill in the hands of a capable workman. A word of praise is, however, due to the Ridgway machine clipper, which is expeditious, and, under certain conditions, economical where an extensive system of hedges has to be kept in form.

The season for clipping a hedge, fortunately, is an extended one, for it is work which may be done at any time that labour can be spared for it. As a rule, it is well to do it when the sap is down, and that is during the period when other work on the farm is quiet. Some who take great care of their hedges trim between laytime and harvest, and again during winter. By some, summer clipping is objected to, as they urge that the cutting of the wood whilst the sap is full is detrimental to the vigour of the hedge, but it would, I think, be found difficult to prove direct injury. When hedges are really strongly established and vigorous, it is not altogether unfavourable for them to be retarded slightly in their growth, as it keeps them from running to too great top growth, to the benefit of the bottom growth. Trimming is a form of pruning, and frequent pruning tends to the formation of a greater number of branching shoots, causing the face of the hedge to present a denser front. The work on well-established hedges is most quickly performed by a long-handled splashing-bill, though on a small hedge a short fagging-

hook may be used with advantage. The old maxim that a hedge should be trimmed whenever the knife is sharp enough indicates the advantage of trimming, and the little need to regard the season at which it is done; but a point in favour of summer trimming is that it ensures the destruction of weed growths, and therefore the encouragement of the bottom growth of the hedge, also that where live stock—particularly sheep—are kept, it is of advantage to cut during summer while the thorns are soft, as there is less chance of the animals being pricked and lamed. Most other features tend towards autumn and winter trimming.

II.—THE PRESERVATION AND RESTORATION OF OLD HEDGES.

THE PRESERVATION OF ESTABLISHED HEDGES.

The preservation of established hedges is of equal importance with their construction. That they very frequently receive insufficient attention is shown by the fact that there are so many hedges which through gappiness are not fences. Neglected fences take many forms; they may be roughly grown hedges which for the shelter of animals have been allowed to attain to the height of twenty feet; or they may be not more than three feet in height, which have been trimmed on the top, but through neglect about the roots have taken the form of a series of gaps below. Between these extremes there is practically an endless variation, and it is impossible here to deal with all separately, but this, again, is not necessary, as general principles apply to all, and the details can be carried out in accordance with the individual case as it presents itself.

A common method, and generally a bad one—for the hedge is not a fence for some years after—is to cut down the hedge to the stump or stool, to allow the young wood to grow to a hedge; it possesses the advantages of not requiring much skill to effect it. If, however, there are very coarse high stools it is sometimes beneficial to level off the old stumps to make them throw up an entirely new growth which may subsequently be laid. Big old stumps are unsightly, and tend to make the newly laid hedge become gappy; they, of course, originate from bad cutting on previous occasions, and point to the necessity of lower cutting. When hedges are planted on high narrow banks the falling away of the soil bares the stump, making it protrude, and is one of the chief objections to this system of planting. Whatever the system of renovating, the earth requires to be well laid up to the stems. Cutting down to the stool is practised in some few districts, at a long distance from coal-fields, as a source of fuel.

Pollard trees and hedges before the advent of railways were very important sources of fuel, and a broad hedgerow was a sort of narrow plantation; such hedgerows are met with in the more southerly counties, where they are largely relied upon for fuel; and it is significant that the hedges in those counties are irregularly and inefficiently kept, the weakness of the fences being encouraged by using dead wood when living wood is at hand. Considering the amount of land they occupy, the harbourage they afford for insects, the nurseries they are for fungal diseases through the supply of weed hosts, and how they tend to the foulness of the land through the seeds of weeds spreading from them, the advantage of the fuel can scarcely be sufficient to warrant their maintenance in the place of more effective but less extensive narrow quicks; particularly as so much woodland, capable of supplying the wood for fuel, which the custom of the country regards as necessary, exists where the wide hedgerows are still in vogue. Mr. J. F. Beddall, whose early years were spent in Essex, writes me on this point:—

In Essex and some other counties, as you know, the hedges are chiefly on banks, and are dealt with in a rather primitive manner. They are left to grow up roughly for eight or nine years, then cut off close to the bank, leaving live stakes from eighteen inches to two feet in height at intervals of eighteen inches, between which a layer of bushes can be placed. This is sufficient to prevent sheep and other stock straying until the hedge grows again. The ditch is “done out” at the same time. This is, of course, on arable land. I do not think a man could be found in Essex who could lay a fence as we understand it here (in Bedfordshire).

A SCOTCH METHOD OF TRIMMING.

Mention has been made of the hedges on the Duke of Bedford's estates, and Mr. C. P. Hall, the agent on the Woburn property, has taken special pains to introduce good new methods, one of which was illustrated by a Scotch workman, and attracted much attention from the manner of working, and the severity of the cutting, though the effect on the fence has proved to be highly satisfactory. It was a practice with which I was unacquainted, and is probably not known to many, therefore a detailed description may be interesting. The workman uses a short-handled bill which he uses with a peculiar circular sweep. Slightly stooping, he makes an upward sweep with the bill in his right hand, cutting the wood with a long, vertical bevel; when the stroke is made as far as his right hand will reach, which will be over his left shoulder, the left hand seizes the bill, and passes it down behind him, when the right hand meets it, again taking possession of it, bringing it in front again, commencing another upward stroke. The bill thus

makes a continuous sweep or circle, up before him, and down behind him. This is done with great rapidity by a skilled workman: the circular sweep seems to have the effect of giving special impetus to the stroke; in fact, it easily cut through rods two inches in diameter. The long bevel necessitates a body movement, which is thus well obtained. The hedge when cut presents the appearance of a number of sharp-pointed rods, rising gradually from outside so as to form a ridge or hog-mane. From these there is an abundance of lateral shoots given off. The long bevel acts beneficially by preventing too free a circulation of sap in the upper part, consequently the sap goes to produce bottom growth. When a rod is cut nearly horizontally across, the sap flows unrestrained to the top, and a vigorous growth takes place there to the detriment of the lower part. When hedges are intended for ornamental purposes, the beauty is much destroyed by unsightly gnarled growths at the point where the growing rods are cut off. To obviate this, when layering hedges, dead stakes are frequently used, but if growing stakes are employed, excessive growth at the top may be prevented by hacking them nearly through at the base, so that bottom growth is induced, and the upward flow of sap hindered. By making a long bevel the flow is gradually checked, and bushiness at the top is obviated. The treatment as practised appears severe, and in the first instance, where tried in Bedfordshire, the tenant asked Mr. Hall—perhaps not altogether without some humour—if he would not find him posts and rails to protect the hedge; however, in the course of a year it had grown so well that it was a capital fence, and showed remarkable vigour. There is no doubt that the principle of the long bevel might be used with great advantage in most systems of live hedge renovation.

CUTTING BACK TO THE STEM.

Another practice is that of cutting back, or ribbing, which consists in cutting the brushwood or side-shoots of overgrown hedges back to the middle, leaving a more or less bared framework for the new shoots to spring from. This is suitable where the hedges are not gappy, and is applicable where, after a long period of trimming, the hedge shows signs of decay in the middle, through dense growth on the outside, which has smothered the inside; for a hedge too wide and thick always suffers at the heart from want of light and air. The process is usually a simple one (figs. 3 and 4), but the ultimate shape should be kept in view. Cutting back, however, is not so conducive to

thick bottom growth as where the stems are hacked at the base as when layering, so as to arrest the upward flow of sap, and allow it to be utilised freely by the lower shoots. However, by leaving a good growth at the base, sap is attracted, so that with

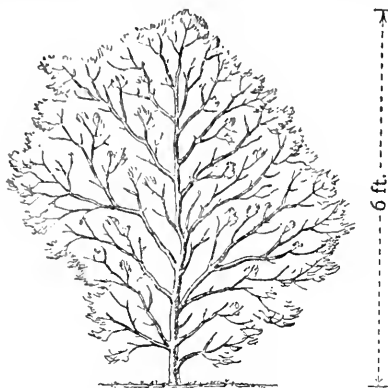


FIG. 3.—Section through over-spreading hedge.



FIG. 4.—Section through over-spreading hedge (fig. 3), cut to hog-mane shape.

the light and air good growth is secured there. Where there are double lines, one row may be cut down to the stump, leaving the other as a fence and blind (figs. 5 and 6) until the first row grows up, a dense bottom growth being obtained. In course of

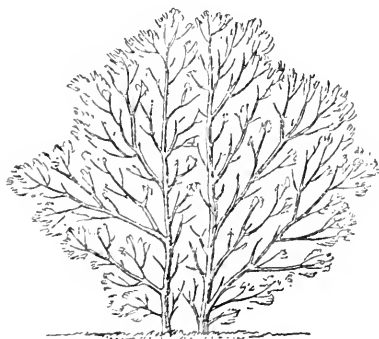


FIG. 5.—Section through over-spreading double-planted hedge.

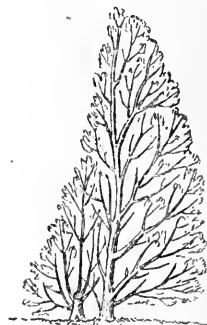


FIG. 6.—Section through an over-spreading double-planted hedge (fig. 5), two years after one side was cut down to stump, and the other side trimmed in slightly.

years, when the younger side has grown up, the older may be cut down, in which way vigorous young wood is obtained at all times; this is of course an inexpensive method of hedging, but is not applicable where the hedge has become gappy.

LAYERING OR LAYING HEDGES.

When the hedge is tall and roughly grown, having been left untrimmed for a number of years, laying is the best method of treatment, the long rods being suitable for wattling. In dealing with such a hedge a very important feature is the selection of the wood best suited for the purpose of wattling. In the first place all decaying stumps should be cut off level with the ground, and rods for wattling and stakes chosen from the most vigorous stools. Young rods throw out the most frequent shoots. Honeysuckle, briars and clematis are among the worst enemies to hedges, as they smother the growth of the quick. Barberry, from its acting as a host to the fungus causing mildew in wheat, should be taken out. Elder is another of the greatest enemies to hedges, its straggling growth making them unsightly, and as it spreads rapidly it soon occupies a considerable space, which quickly becomes gappy. Where elder plants are common the seeds are carried to the hedgerows by birds, so that they frequently establish themselves.

When the wood is of varying thickness, and the hedges gappy, it is advisable, from time to time, to stand back a few yards from the hedge so as to determine which wood should be used and which discarded. It is often necessary to trim down the brush to make an opening so as to give freedom in working. Where the wood is of equal thickness, of small growth, and there are no gaps to fill in, it is only needful to cut out what is unnecessary; but otherwise a good deal of the success in making the new hedge depends on the preparation of the wood before laying. The bank or bed should be cleaned before the wood is brought down, as it is most convenient to do it then.

Wherever practicable the wood should be cut with an upward stroke, as the cut surface is then smooth, so that water runs off easily, and little decay takes place; but when cut with a downward stroke there is vibration, which causes the wood to splinter, so that rain and frost, together with almost constant dampness, cause considerable decay. An inspection of a hedge which has been cut with the down stroke always reveals in course of time the injury thus brought about, and it is one of the chief causes of gappiness in old hedges. When the wood is thin, a single stroke, as shown at C (fig. 7), is sufficient. It is important to cut it so far through that it may be bent without splintering; the angle at which wood is to be laid in the wattle regulates the extent of the stroke, for the lower it is laid the further through is it necessary to cut. Where the wood is

thicker, as at A (fig. 7), an upward cut should be taken, after which a downward cut may be made without splintering, a chip being taken out, so that the rod may be laid down as at B (fig. 7). So long as there is only a small amount of wood adhering to the bark the sap will flow to the upper part, and it is often advisable to cut out a long slice of wood as shown at D (fig. 7).

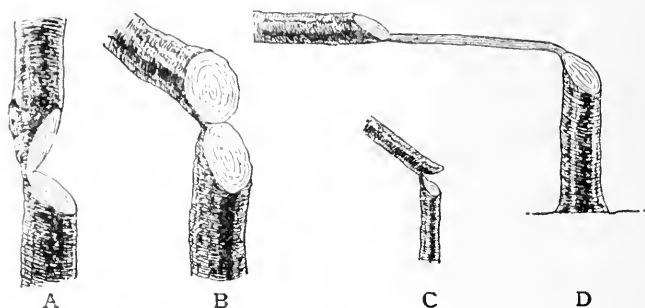


FIG. 7.—Methods of cutting growing rods for laying.

The quantity of wood left in for laying depends on the nature of the animals against which it is designed to fence ; and the height of the fence of course regulates the height at which the stakes are left. There is one most important point to bear in mind when renovating live hedges, and that is that the object is to

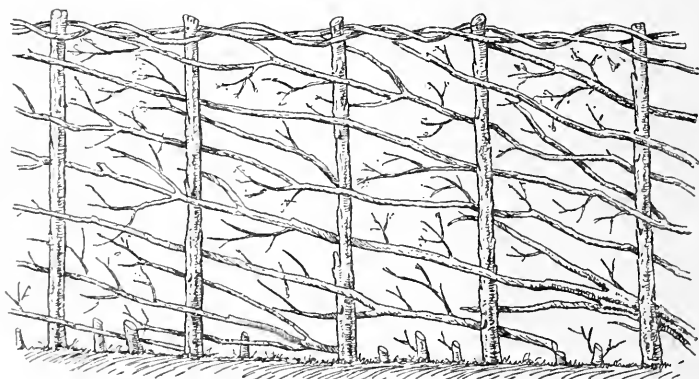


FIG. 8.—Newly laid Quick-set Hedge.

procure a new growth of wood : too often when hedges are laid far more wood is worked into them than is advisable. If enough wood is left in to make the hedge as thick as is necessary (fig. 8), it is obvious that additional growth is superfluous. Not only is it superfluous, but the hedge suffers because the young

wood growing up smothers that in the middle, and in course of time the heart of the hedge decays, causing weakness to the whole fence, bringing about its untimely destruction, or rendering it necessary to do the work again within the course of a very few years. The object, therefore, should be to reconstruct the hedge so that it may grow into a fence. Comparatively few wattles of young vigorous wood are sufficient to form a barrier; and the young shoots of one year's growth make a blind which prevents animals from attempting to break through. Whether a hedge is laid or cut back this holds equally good. Nor should this point be lost sight of when filling in gaps; too often a large quantity of dead wood is laid in, with the result that new wood does not grow in. A small piece of post and rail fence, sufficiently durable to last until the gap is grown in, should always be used in preference.

It is usual to fence from 4 feet to 4 feet 6 inches against cattle, and 3 feet to 3 feet 6 inches against sheep and pigs, but deer require 6 feet to 6 feet 6 inches. Hares and rabbits may be kept back by fencing 3 feet high, but they prefer going through instead of over, and without wire netting it is practically impossible to make a live hedge which will not show some weak spot through which they find their way.

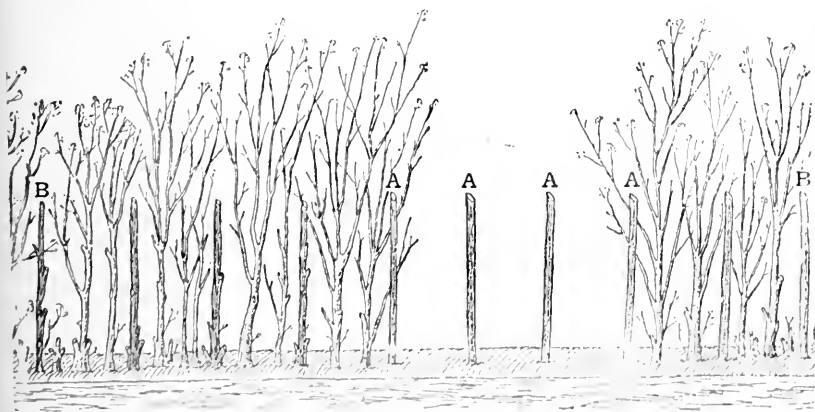


FIG. 9.—Hedge thinned for laying, and prepared for stopping gap. A, dead wood stakes.
B, live wood stakes.

The illustrations, figs. 9 and 10, show the mode of preparing and laying a hedge, a portion of the brush being cut off to show the method of wattling; at the same time the filling in of a gap is illustrated. When the earth is laid up and the rods prepared, they should be well interwoven. Young strong stakes should

be chosen, or in the event of there being gaps dead stakes must be provided; these can often be cut out of the wood taken from the hedge. The wattling should preferably be done so that the brush is placed on the side opposite to that on which the man works; a straight side may thus be kept, provided the stakes are set straight: the workman sees better the thickness at which he is working when on the side opposite to the brush, and operates more freely. After the brush is laid it is necessary to put on a header or binder, which consists of a number of thin rods interwoven about the stakes, thus preventing the brush from springing up, or from being lifted from between the stakes by cattle. In the case of live hedges it is not necessary that this be very stout, as in a year or two it is not needed. The binder is put on in the opposite direction to the wattling—that is, the thick ends are placed in the opposite direction.

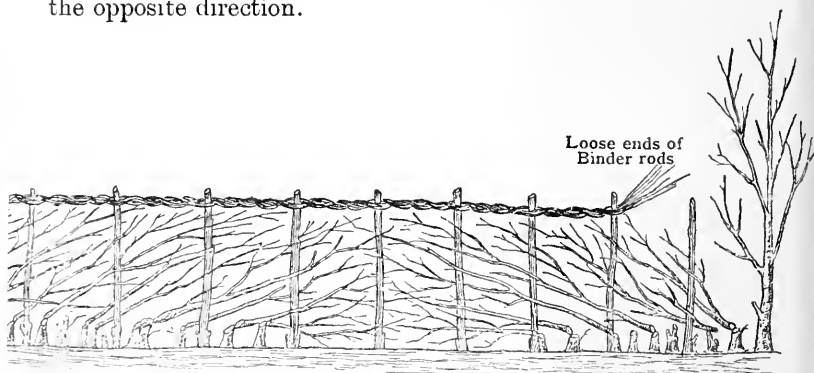


FIG. 10.—Hedge (fig. 9) laid, and gap filled in with living wood.

When the laying is completed, the after management of the hedge should be directed to keeping it in shape. If a hedge is well laid it may be kept in shape for twenty or even forty years by judicious thinning, and by keeping the ground clean at the base. Often, however, when once the hedge is laid nothing further is done, but it is allowed to grow up for a number of years to become a straggling fence again, and has to undergo re-laying. As a rule, although the practice is a common one, high-class hedges are not obtained in this way; moreover, the big hedge growth conduces to corresponding root growth, which causes the roots to run far afield for nourishment. The object is usually either to secure wood for other purposes, or to provide shelter for the animals. Hedges are of very considerable value as shelters, but there can

be little doubt that it is more advantageous to put up an inexpensive field shelter where the animals can find dry lair, and be sheltered from rain and excessive sun heat. When this is done the manure accumulates so that it can be applied about the pasture instead of being chiefly deposited under the hedges, where it only feeds the hedges or produces rank herbage, which is not eaten but trodden underfoot. A fence as high as a bullock will break the wind, and a thick, well-kept one is more effectual than one which has become weak at the bottom, so that the wind draws through, even though there may be growth several feet high. Hedges thus allowed to run away are more expensive to renovate, and generally big stumps form which are unsightly. Although in laying a hedge it is not necessary to make it more than 4 feet to 4 feet 6 inches in height at the time, a hedge required for shelter as well as for fencing may be allowed to grow as high as 6 feet, up to which height it may be kept in shape with ease, though care is necessary to insure good bottom growth.

III.—HEDGES NOT OF WHITETHORN.

OTHER PLANTS SUITABLE FOR FORMING HEDGES.

So much that relates to hedge-growing generally has been stated in the section dealing with whitethorn hedges, that it only remains to mention a few of the more important items relating to other plants suitable for hedges. Nor is it necessary to deal with all the plants that could be grown so as to make a fence, the object of this paper being primarily to discuss such as are of chief practical utility.

The Blackthorn (*Prunus spinosa*) makes a good hedge, particularly on strong loams, which are generally regarded as being plum soils. The hedge is rather more liable to grow away from the bottom than is the whitethorn, and a particularly objectionable feature is the habit it possesses of spreading out into the fields by means of stolons. So strong is the habit of stoloniferous growth that I know of considerable lengths of hedges along ditches on the outsides of arable fields which have grown from bushes, though probably some of the growth has come from seeds which have grown beyond the stump: from whatever source I can testify to their denseness. If there is a place where it can be substituted with advantage over whitethorn it is on strong wet soils. When grown on the side of a ditch blackthorn has great tendency to extend down the bank, owing to its suckers. This is objectionable, as it hinders the cleaning, for want of which the hedge ultimately weakens.

Within comparatively recent years the *Myrobella* (*Prunus Myrobalana*) or cherry plum has attracted notice. On plum soils it thrives well, and grows with remarkable rapidity, quickly forming a fence, and providing shelter. In some instances brought under personal observation, when planted on light land it has not been so satisfactory, though I am not in a position to state whether want of more attention previously to planting had any effect on the small success. It possesses the advantage of producing stout thorns after it has been planted a few years. Where it grows well it is decidedly valuable for providing shelter in a short time. Owing to its rapid growth it is necessary to trim it twice a year to keep it from spreading wide and to insure denseness of foliage.

The Beech (*Fagus sylvatica*) is a favourite hedge in some districts, especially in exposed positions, and in wet situations. As a means of shelter for stock, hop-gardens, or orchards it has special value, as it may be trained to a very considerable height without losing its compactness, and great height may be obtained although the fence is narrow. Its rapid growth renders it necessary to fence for protection of the young hedge for a far shorter period than is required by whitethorn. At the same time it cannot be regarded as so good a fence against cattle, and almost all old beech hedges show weakness at the base, big limbs with few lateral interlacing branches being present. Where used for fencing against cattle a ditch may be regarded as necessary to help it. Too close planting induces to speary growth, and the plants should not be placed nearer than 18 inches. Yet at 18 inches apart there is considerable danger of animals working their way through the thornless plants. The hedge should be clipped with hedging-shears in October.

The Common Crab (*Pyrus Malus*) is sometimes used as a hedge, but there is no good reason for resorting to it in preference to plants previously mentioned. Elm, maple, birch, and hornbeam are also used, but are worse if anything than crab, though the birch is occasionally found useful on thin soils at high altitude. For orchards some of the hardy crabs such as the Siberian may be regarded as deserving a place, as supplying shelter from winds, and also on account of the handsome fruit they bear.

Elder (*Sambucus nigra*) forms an absolutely bad fence. It is easy to raise, but has a straggling habit of growth; whilst its presence near other hedges is objectionable, because birds carry away so many seeds, and the unsightly elder becomes established in them, smothering out considerable lengths in course of time.

Poplars (*Populus*) are of little use against cattle, and are chiefly valuable as providing shelter, their rapid growth adapting

them as shelter for orchards and hop-gardens, and as nurseries to other trees.

The Alder (*Alnus glutinosa*) and the Goat Willow (*Salix caprea*) or Sallow are suitable for fences on very wet soils where other hedges would not thrive. Willow is easily propagated by placing freshly cut rods in water, when they soon develop a plentiful supply of roots. It is advisable to place them in shallow water, for at whatever depth they are immersed the rootlets form near the surface. Even if planted as cuttings in ordinary moist soil they will grow; the holes should first be made so that the bark does not peel off in planting. For fencing it is best to place them in the form of a trellis, when rods of two or three years' growth, and about 6 feet long. If planted about 18 inches apart so that the rows cross themselves at right angles a hedge quickly forms, and with a yearly trimming will keep a fair fence.

EVERGREEN HEDGES.

Several kinds of evergreen are used for fencing, the best of which is Holly (*Ilex Aquifolium*), which, from its dense habit of growth, strong wood, and prickly leaves, makes a strong fence against animals and affords the best shelter both summer and winter. It is slow in growth, but once established is very lasting; a tight fence 5 feet in height and 16 inches through will hold in check any bullock. Those who have visited the Royal Agricultural Society's Experimental Farm at Woburn may have noticed the well-known Aspley hedge, where for several hundred yards there is a dense wall of holly thirty or more feet in height, perfectly compact and gapless, showing how dense the bottom growth may be maintained, even though the hedge is allowed to reach such a height. This grows on a thin sandy soil, and holly seems to affect such soils; the soils on which it thrives least are those which are wet and heavy. It is a point in favour of holly that the hedges may be grown perfectly upright, the shade and droppings from the parts above seeming to have no injurious effect on those below. Not only is this the case, but it grows well even under trees where other hedges do not succeed. Hedge-row timber is the greatest bane to most hedges; therefore, this feature possessed by holly makes it specially valuable.

As a rule, plants twice transplanted, and about a foot high, are used, and cost about 2*l.* per thousand. The process of planting is usually known as holing and covering, being similar to the spading-in of potatoes planted on the flat. The line of planting is indicated by a gardener's line, then a hole is opened along this by the aid of a spade, and a plant inserted and

held in it; a foot further along the line another hole is dug, and the mould thus procured is used to fill in the hole previously made. This, by covering in the roots of the plant being held there, completes the planting. The practice is continued all along the line, the earth being lightly trodden about the roots, but firmly enough to secure the plant, and the work is thus expeditiously done. The bed should be well prepared, clean, friable, and well manured. The plants should be freshly raised, and if dry should be moistened previously to planting. If in the course of a year or two it is evident that the plants have received a check, so that the root growth is not sufficient to maintain the top, the plants should be cut down near to the ground, when they will recover their vigour. With this exception it is better to allow them to grow to the height required as a hedge, and then to trim into shape. Almost any shape may be grown, as by trimming bottom growth may be induced, the plants having a natural tendency to produce lateral shoots low down. Trimming should be done with shears in July.

Furze, gorse, or whin (*Ulex europæus*), is an evergreen valuable for fencing on barren sands and in exposed situations where other plants would not be easily maintained. Owing to the difficulty of keeping the bottom growth thick it is advisable to grow it on a bank. A flat-topped bank about three feet in height, wide enough for a line of hedge to be carried, should be prepared, and the seed sown in March or April. The object should be to maintain a short sturdy growth; close clipping should therefore be resorted to in May or June. In the course of years, if weak places appear, new plants should be inserted. Experience has shown that furze hedges decay most readily when clipped at any time from autumn to early spring.

SIXTH EDITION

(TWENTY-SIXTH THOUSAND)

OF

Elements of Agriculture

A TEXT-BOOK

PREPARED UNDER THE AUTHORITY OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

By W. FREAM, LL.D.

CONTENTS.

PART I.—THE SOIL.

1. ORIGIN AND PROPERTIES OF SOILS.
2. COMPOSITION AND CLASSIFICATION OF SOILS.
3. SOURCES OF LOSS AND OF GAIN TO SOILS.
4. MOISTURE IN SOILS.
5. IMPROVEMENT OF SOILS.
6. TILLAGE.
7. IMPLEMENTS FOR WORKING SOILS.
8. MANURES AND MANURING.

PART II.—THE PLANT.

9. SEEDS AND THEIR GERMINATION.
10. STRUCTURE AND FUNCTIONS OF PLANTS.
11. CULTIVATED PLANTS.
12. WEEDS.
13. SELECTION OF SEEDS.
14. IMPLEMENTS FOR SECURING CROPS.
15. GRASS LAND AND ITS MANAGEMENT.
16. FARM CROPS.
17. FUNGUS PESTS.
18. INSECT PESTS.

PART III.—THE ANIMAL.

19. STRUCTURE AND FUNCTIONS OF FARM ANIMALS.
 20. COMPOSITION OF THE ANIMAL BODY.
 21. FOODS AND FEEDING.
 22. THE ART OF BREEDING.
 23. HORSES: THEIR BREEDS, FEEDING, AND MANAGEMENT
 24. CATTLE: THEIR BREEDS, FEEDING, AND MANAGEMENT
 25. SHEEP: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 26. PIGS: THEIR BREEDS, FEEDING, AND MANAGEMENT.
 27. THE FATTENING OF CATTLE, SHEEP, AND PIGS.
 28. DAIRYING.
- INDEX OF PLANTS.
GENERAL INDEX.

Of all Booksellers.

486 pages, with 286 Illustrations.

Price THREE SHILLINGS AND SIXPENCE, bound in cloth.

LONDON: JOHN MURRAY, 50A ALBEMARLE STREET, W.

SUMMARY LIST OF
PUBLICATIONS
OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

QUARTERLY JOURNAL OF THE SOCIETY.

Published on March 31, June 30, September 30, and December 31; the Four Parts forming a Volume of about 1,000 pages. Price 3s. 6d. each Part. ~

TEXT-BOOK ON AGRICULTURE.

ELEMENTS OF AGRICULTURE: a Text-Book prepared under the authority of the Royal Agricultural Society of England by W. FREAM, LL.D. 486 pp. with 266 Illustrations. Twenty-sixth Thousand. Price 3s. 6d. bound in cloth.

PAMPHLETS.

PAMPHLETS BY SIR JOHN BENNET LAWES, BART.

VALUATION OF UNEXHAUSTED MANURES. By Sir JOHN BENNET LAWES, Bart., LL.D., F.R.S., and Sir J. HENRY GILBERT, LL.D., Ph.D., F.R.S. Price 6d.

TABLES FOR ESTIMATING DEAD WEIGHT AND VALUE OF CATTLE FROM LIVE WEIGHT. By Sir JOHN B. LAWES, Bart. Price 1s.

VETERINARY PAMPHLETS BY SIR GEORGE BROWN, O.B.

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS. Fourth Edition (1895). 64 pp. With Sixty Illustrations. Price 1s.

ANIMALS OF THE FARM IN HEALTH AND DISEASE. 72 pp. With 52 Illustrations. Third Edition (1895). Price 1s.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHOEING. 20 pp. Third Edition (1892). With Twelve Plates. Price 6d.

CONTAGIOUS FOOT-ROT IN SHEEP (1892). 16 pp. 8 Illustrations. Price 6d.

OTHER VETERINARY PAMPHLETS.

THE MARE AND FOAL. By Professor J. WORTLEY AXE, M.R.C.V.S. 58 pp. With Twenty Illustrations. 1898. Price 1s.

THE LAMBING PEN. By HAROLD LEENEY. 3rd Ed. (1897). With 9 Illustrations. Price 6d.

ABORTION IN CATTLE. Report of the Special Committee on Abortion in Cattle appointed by the Council of the Society, together with the Complete Minutes of Evidence of the Witnesses examined, and Appendices. 88 pp. (1894). Price 1s.

PAMPHLETS BY MR. CHARLES WHITEHEAD, F.L.S., F.G.S.

HINTS ON VEGETABLE AND FRUIT FARMING. Fourth and Enlarged Edition (1893). With Seven Illustrations. 53 pp. Price 6d.

METHODS OF PREVENTING AND CHECKING THE ATTACKS OF INSECTS AND FUNGI. With Twenty-six Illustrations (1891). 40 pp. Price 6d.

HOP CULTIVATION. With Thirteen Illustrations (1893). 48 pp. Price 1s.

PAMPHLET BY DR. J. AUGUSTUS VOELCKER, M.A., B.Sc.

THE DRYING OF FRUIT AND VEGETABLES. With 4 Illustrations (1897). 20 pp. Price 3d.

DAIRY PAMPHLETS.

(Issued under the authority of the Dairy Committee of the Society.)

THE PRACTICE OF (a) CHEDDAR AND (b) CHESHIRE CHEESE MAKING. Price 2d. each.

SIMPLE RULES FOR BUTTER MAKING. Revised May 1896. (Sheet.) Price 1d. each, or 5s. per 100. Mounted on card and varnished, to hang up in the Dairy, 6d. each. (These Rules can also be had in the Welsh Language.)

OTHER PAMPHLETS.

TECHNICAL EDUCATION IN AGRICULTURE. By W. FREAM, B.Sc., LL.D. With Two Reports by the Education Committee of the Royal Agricultural Society of England. Second Edition (1891). 24 pp. Price 6d.

EXPERIMENTS IN MAKING ENSILAGE DURING THE WET SEASON OF 1888. By the late H. KAINS-JACKSON. 64 pp. Price 6d.

COTTAGE SANITATION IN RURAL DISTRICTS. By H. MACLEAN WILSON, M.D., B.Sc. With a Preface by T. PRIDGIN TEALE, F.R.S. New and Enlarged Edition. 32 pp., 12 Illustrations (1896). Price 3d. per copy; 2s. per doz.; 12s. 6d. per 100.

LIST OF GOVERNORS AND MEMBERS OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND. Corrected to 31st December, 1898. 136 pp. Price 2s. 6d. to Members, 5s. to Non-Members.

The above can be obtained at the Society's House, 13 Hanover Square, London, W.; or of Mr. JOHN MURRAY, 50a Abchurch Lane, London, E.C.

COLOURED DIAGRAMS.

(Obtainable from Messrs. W. & A. K. Johnston, 5 White Hart Street, Warwick Lane, E.C., or Edinburgh.)

THIRTY DIAGRAMS OF INJURIOUS INSECTS. Drawn from Nature by the late Miss GEORGIANA E. ORMEROD, in conjunction with Miss ELEANOR A. ORMEROD, F.R. Met. Soc.

Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d. Sets of Six, 7s. 6d.; or varnished and mounted, 12s. 6d.

EIGHT DIAGRAMS REPRESENTING THE LIFE HISTORY OF THE WHEAT PLANT (after FRANCIS BAUER). With Explanatory Pamphlet by W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet) 10s. per Set of Eight Diagrams.

THE POTATO DISEASE. By W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

ORCHARD AND BUSH-FRUIT PESTS

AND

HOW TO COMBAT THEM.

BY

CECIL WARBURTON, M.A., F.Z.S.,

ZOOLOGIST TO THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

WITH TWELVE ILLUSTRATIONS.

LONDON :

JOHN MURRAY, ALBEMARLE STREET.

1902.

SUMMARY OF CONTENTS.

	PAGE
INTRODUCTION	1
GENERAL REMARKS	2
LEAF-POISONING INSECTICIDES	2
DIRECT INSECTICIDES	3
ORCHARD LEAF PESTS	4
WINTER MOTH	4
PEAR AND CHERRY SAW-FLY (Slug-Worms)	5
RED SPIDER	7
ORCHARD BLOSSOM PEST	7
THE APPLE BLOSSOM WEEVIL	7
ORCHARD FRUIT PESTS	9
THE CODLIN MOTH	9
THE APPLE SAW-FLY	10
THE PEAR MIDGE	11
ORCHARD WOOD PESTS	12
WOOLLY APHIS (AMERICAN BLIGHT) AND MUSSEL SCALE	12
THE GOAT MOTH	12
THE LEOPARD MOTH	14
BUSH-FRUIT PESTS	14
CURRANT AND GOOSEBERRY MOTH. MAGPIE MOTH	14
GOOSEBERRY AND CURRANT SAW-FLY	15
CURRANT CLEAR-WING MOTH	16
BLACK-CURRANT GALL-MITE. BIG BUD	17
THE RASPBERRY BEETLE.	19

ORCHARD AND BUSH-FRUIT PESTS AND HOW TO COMBAT THEM.

INTRODUCTION.

THERE are a great many insects which do harm to fruit trees, and no part of a tree is free from possible attack. The leaves may be eaten by caterpillars, or they may shrivel because their sap is sucked by green fly or "red spider." The blossom may become the home of a beetle, and the "setting" of the fruit prevented. The young fruit may be destroyed by maggots, or the old fruit may be so burrowed and spoiled by grubs as to lose much in market value. The boughs may be smothered with "woolly aphis" or "scale," and the trunk may be riddled by the borings of caterpillars; nor are the roots by any means safe from attack.

It might appear a simple matter to lay down general rules for the treatment of these different classes of pests; to say, for instance, that when caterpillars are eating the leaves it is best to do so-and-so, without troubling one's head as to the particular caterpillars at work. Such general rules are certainly of some use, but it very often happens that the time when the insect is noticed to be doing harm is not the time when it is easiest to destroy it wholesale. There is sometimes a period in the life of an insect when it is, so to speak, delivered into our hands, and we can only take advantage of this period if we know quite certainly what the insect is and how it lives.

For example, if caterpillars are eating the leaves in the spring, we may kill a great many of them by using one of the washes, which we shall speak of presently; but if among the caterpillars we recognise a great many as belonging to the "winter moth" we may do better still—we may so treat the trees in the autumn that there shall be very few of those caterpillars, at all events, on the leaves in the following spring. It is by no means waste of time, therefore, to try and make out what particular insect is at work, for we shall often find that there is a weak spot somewhere in its way of living. We do not mean that it is necessary to know its scientific name, which is only given for the sake of leaving no uncertainty as to the

creature we are talking about, for popular names, like "wire-worm," are often given to quite different creatures, with different habits of life; but "winter moth," "apple-blossom weevil," "woolly aphis" are quite satisfactory names, and leave no doubt as to the insect in question.

GENERAL REMARKS.

Certain apple pests spend the winter in hiding-places in the bark of the trees. This is the case with the codlin moth, which hibernates as a chrysalis, and with the apple-blossom weevil, which passes the winter in the beetle form. A favourite shelter is a crack, roofed over by a flake of loose bark. It is advisable to destroy such shelter, and to expose these pests to the alternate frosts and thaws of winter by scraping the trunks, and removing, as far as possible, all the loose bark. The operation is still more successful if followed by a dressing of some suitable insecticide, well scrubbed into the cracks with a stiff brush during the winter.

It is against the various insects which attack the leaves in spring and summer that washes and sprays are chiefly used. They cannot, of course, be applied while the trees are in blossom, for fear of destroying or keeping away the insects which are necessary to fertilise the flowers, but trees are sprayed before the blossom has opened, or after the fruit has set.

There are two quite different classes of insecticides used for this purpose. One class is intended to kill the insect directly, while the other class brings about the destruction of the insect indirectly, by poisoning the leaves on which it is feeding. It is clear that this latter class is of no use against sucking insects, for the poison will not reach the sap on which they feed, but it is very effective against all the caterpillar tribe, which feed upon the substance of the leaf. It is also clear that it would be sheer waste to deluge a tree with a leaf-poisoning insecticide. It should be delivered as a fine spray, so that the poison may be sprinkled evenly over all the leaves.

It will be convenient to give at once the ingredients of a few of the most useful and readily prepared washes, so that they may be simply referred to under the various insect pests instead of being re-described in each case.

I.—LEAF-POISONING INSECTICIDES.

- (a) Take half a pound of Paris (or emerald) green and stir well in a hundred gallons of water, adding a pound of lime. Distribute in a fine spray over the foliage,

taking care to stir the mixture frequently, or the Paris green will sink to the bottom.

N.B.—Paris green is sold as a paste and as a powder. The paste is safer, not being so liable to blow about and be inhaled. If the powder is used, it should be pulverised before mixing, unless very fine in grain.

- (b) Take six ounces of arsenate of soda and dissolve in a little water, pouring the solution into a hundred gallons of soft water. Also dissolve eighteen ounces of acetate of lead ("sugar of lead") in a little water, and pour the solution into the hundred gallons containing the arsenate of soda. Stir frequently during use, and deliver as a fine spray. A little soft soap added to the mixture will help it to adhere to the leaves.

Caution.—The mixtures (a) and (b) are highly poisonous, and must not be left carelessly about, nor must the vessels in which they are mixed be used for other purposes without careful cleansing. Care must be taken not to inhale the arsenic powders. Fruit must not be sprayed within a few weeks of gathering.

II.—DIRECT INSECTICIDES.

- (c) Dissolve half a pound of soft soap in one gallon of soft water. Add this to two gallons of paraffin (kerosene) oil, and stir thoroughly. This gives a "kerosene emulsion," which must be diluted for use. The strength of the mixture will depend partly on the quality of the paraffin, and partly on the nature of the object sprayed—whether tender and delicate leaves, strong and vigorous foliage, or bare winter branches. An average strength for foliage will be obtained by adding fifteen gallons of soft water to the three gallons of emulsion, but it is as well to test its effect on the leaves. For winter use a much stronger mixture is permissible, five to ten gallons of additional water being sufficient.
- (d) Boil twelve pounds of quassia chips, and add the extract to a hundred gallons of water. Six or seven pounds of soft soap may be advantageously added to the wash.
- (e) A useful wash for winter use only, to kill hibernating insects and their eggs, or to clean tree-trunks smothered by moss or lichen, may be made thus:

Dissolve separately in water one pound of caustic soda and one pound of crude potashes. Mix the solutions, stirring up three-quarters of a pound of soft soap in the mixture. Add sufficient water to make ten gallons. The best time for its application is the middle of February.

I. ORCHARD LEAF PESTS.

WINTER MOTH.

Hosts of caterpillars may sometimes be found devouring the leaves and even the blossoms of orchard trees in the spring. Several different kinds will probably be present, but they all do harm in the same way, and as soon as they are observed in any numbers the trees should be sprayed with one of the mixtures (a) or (b). If most of the caterpillars are "loopers"—arching their backs as they crawl along—it may be concluded that the "Winter moth" is at work. The "March moth" and the "Mottled Umber" also have "looper" caterpillars, but as all three have practically the same life-history the particular species is of little importance. The important point in the life-history of the Winter moth and its allies is this, that only the male moth can fly, the female having such ridiculously small and stunted wings that they are of no use to it. Indeed the females would not be taken for moths at all by the ordinary observer, their fat, almost wingless bodies and long legs giving them quite a spider-like appearance.

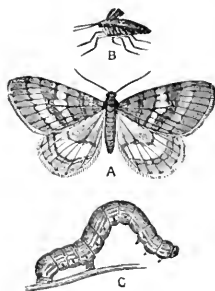


FIG. 1.—A, Male Winter moth; B, Female, natural size; C, Caterpillar, enlarged.

The caterpillars, at first so small as to be almost invisible, feed on the leaves till they are fully grown. Those of the Winter moth are then about an inch in length, green, with narrow white lines along the sides, and with brown heads. They then leave the tree, usually letting themselves down by a thread, and crawl to some sheltered place, where they turn to chrysalids. From these chrysalids most of the moths come out in the following autumn, though some do not emerge till the winter is past.

Now the female moths, after leaving the chrysalis, have to reach the twigs and buds of the fruit trees in order to lay their eggs, and, as they cannot fly, they are obliged to crawl up the trunks. If by any means they can be prevented from doing this there will, of course, be no Winter moth eggs on the trees

to hatch out into caterpillars in the following spring. The plan of banding the trees with a sticky substance in the autumn does, to a large extent, prevent the ascent of the female moths, and greatly reduces the number of caterpillars in the following year. Bands of grease-proof paper are tied round the trunks, some feet from the ground—high enough to be clear of any fruit bushes below—and these are smeared with some adhesive substance which does not readily dry up, such as cart-grease or one of the numerous preparations in the market.

The moths begin to come out in the middle of October, and continue to emerge all through the autumn, so that the trees should be banded by the second week in October, and the sticky material renewed as soon as it shows signs of drying up.

Hundreds of the wingless female moths are often caught upon a single band, together with several males, doubtless attracted by the presence of the other sex.

The sticky matter should be renewed in the spring to intercept the March moth and such of the Winter moths as have passed the winter in the chrysalis stage.

PEAR AND CHERRY SAW-FLY.

Slug-Worms.

The leaves of the pear and cherry, and sometimes of other fruit trees, are occasionally found to be injured in a very characteristic manner by small slimy grubs, commonly called slug-worms. The upper surface of the leaves is entirely eaten away, the veins and the lower surface being left. The attack is generally noticed in September, but there is an earlier attack, usually not so serious, which takes place in June.

Life-history.—The slug-worms are the grubs of the pear saw-fly, a glossy black insect, not at all striking in appearance, about half-an-inch in length. The ordinary observer would take it for a black fly, though in reality it does not belong to the Diptera or true flies, but to the Hymenoptera, the order which contains the bees and wasps. If examined carefully, it will be found to have *four* wings, like a bee. They are clear and transparent except for a darkish mark on the front wings. Another peculiarity, common to all the saw-flies, is the absence of a “waist,” or constriction between the front and hind portions of the body.

The saw-flies are so called because the females possess a remarkable saw apparatus with which they cut holes in leaves or wood for the reception of their eggs. The pear saw-fly cuts a small hole in a pear or cherry leaf, and inserts an egg, which

is oval and white, and which takes about a week to hatch. The flies which cause the early attack are on the wing at the end of May, and in June their eggs hatch out into tiny grubs which are at first whitish, but soon become dark green and slimy, and much thicker in front than behind. They feed on the upper portion of the leaf, and, when many are present, give out a very disagreeable smell. By the beginning of July they are fully grown—about half-an-inch in length—and now they drop to the ground, into which they burrow to a depth of about

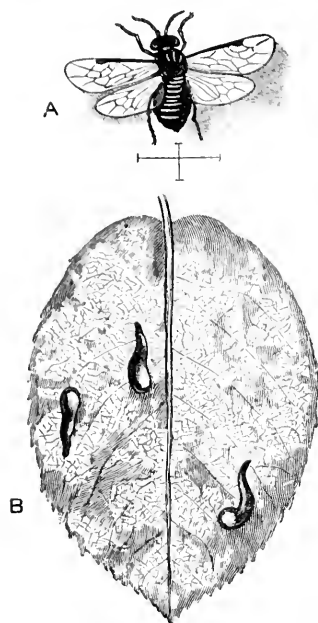


FIG. 2.—A, Pear and Cherry Saw-fly, enlarged; the natural size is shown by the cross lines beneath. B, Pear-leaf with "slug-worms."

two inches, where they enclose themselves in small earthen cocoons, from which the saw-flies come out at the end of July. It is these flies which cause the September attack on the pear and cherry leaves, acting precisely like their parents. The grubs from the second brood, when fully fed (in September or October), seek the ground again, and the cocoons remain there till the flies come out in the following May.

Remedy.—Lime is the substance which has been most successfully used against this pest when the caterpillars are feeding on the leaves. It may be used dry or as a wash. In the first case, it is dusted over the leaves as a powder. The lime-wash is made by stirring a peck of lime and two pounds of soft soap in thirty gallons of water. The dusting, or the spraying, must be repeated two or three times at short intervals, as the first application is thrown off by the grubs with the slime they exude. Early morning or evening are the best times for the operation, which should not be performed while the sun is powerful. The final dusting or spraying should be followed by a good washing down with a garden engine.

Prevention.—The grubs spend the whole winter in cocoons in the ground beneath infected trees, and are thus at the mercy of the fruit-grower from October to May. The best treatment will depend on the nature of the orchard. If the ground is

bare, the surface may be removed to a depth of three inches and burned or buried deeply. Simply digging up and exposing the cocoons to the inclemencies of the weather and to birds is of use. On grass, a heavy dressing of kainit beneath the trees might have a good effect.

RED SPIDER.

The leaves of damson and plum trees are subject to the attack of this pest in hot, dry seasons. From their shrivelled and burnt appearance the disease is sometimes known as "fire-blast." Thousands of the microscopic creatures may be seen like a red dust under the leaves, amongst the network of fine silk threads which they spin.

Life-history.—The "red spider," which is in reality one of the spinning mites, spends the winter under stones or in crevices in wood—whether growing trunks or fencing timber. It comes out in the middle of May and attacks the leaves of damson and plum trees and other plants (hop, currant, gooseberry), sucking the sap and spinning a fine web which chokes up the leaf pores. It lays eggs in the web, and multiplies rapidly, the young being at first six-legged, but afterwards eight-legged like their parents. It is only in especially dry weather that they are greatly destructive, their numbers being speedily reduced by rain.

Treatment.—Either of the washes (*c*) or (*d*) will be found useful against this pest. Sulphur, however, seems to be especially effective against mites, and a good wash is made by boiling one pound of flour of sulphur and two pounds of fresh lime in four gallons of water.

If it is inconvenient to boil the wash, the need for this may be avoided by using sulphuret of lime, four ounces of the sulphuret and two ounces of soft soap being mixed and added to a gallon of hot water. The spraying will probably have to be repeated, as the eggs are not readily killed, and more mites will hatch out after one brood has been destroyed.

II. ORCHARD BLOSSOM PEST.

THE APPLE BLOSSOM WEEVIL.

The attack of the Apple-blossom Weevil may be known by some of the blossoms turning an unhealthy, rusty-red colour, and never opening completely. It is rather a local pest, being present every year to a varying degree in some orchards, while

in others it is entirely unknown. In bad cases of attack the majority of the blossoms may be destroyed. This is most likely to happen in a cold spring, when the blossoming period is prolonged, and the beetle has several weeks for its operations.

Life-history.—During the winter the weevil is in hiding in crannies of the bark or any convenient shelter in the neighbourhood. It comes out when the blossom buds have appeared but have not yet begun to open, usually at the end of March, and the female pierces a hole in an unopened bud with her snout or proboscis, and thrusts in an egg. This operation she repeats day after day, laying one egg in each bud, so that the longer the buds are in opening out the longer she has for her task, and the more harm she is able to do.

In a week the egg turns to a grub in the bud, the various organs of the flower are eaten away and it never opens, but the petals turn a rusty red and form a little case within which the grub in a week or two turns to a chrysalis. Ten days later the chrysalis becomes a weevil, which bites its way out of the bud. Thus the whole development of the insect, from the egg to the weevil, takes place within the bud, occupying four or five weeks.

Remedy.—None. When the attack is noticed, the buds are already destroyed.

Prevention.—1. When trees are badly attacked, shake down as many of the diseased buds as possible into cloths, and destroy them, with the enclosed grubs. They generally fall readily on jarring the tree.

2. In winter remove and destroy any loose rubbish from beneath the trees likely to provide shelter for the weevils, and clean the trunks, scraping off loose bark, and brushing paraffin emulsion, or the wash (*e*), into the crannies.

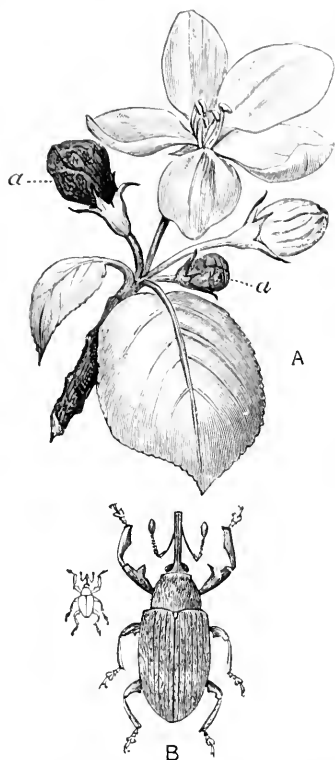


FIG. 3.—A, Spray of apple blossom; the buds marked *a* are attacked by the weevil. B, the Apple-blossom Weevil, enlarged. The natural size of the weevil is shown on the left.

3. The weevils have wings, but it is believed that the females do not fly much, but crawl up the trees, and that sticky-banding in March would catch many of them in their ascent.

4. The wash (*c*), diluted with thirty or forty gallons of water, sprayed on the trees just before the buds begin to open, interferes with the work of the weevils, and is worth trying in orchards where the pest is known to be present.

III. ORCHARD FRUIT PESTS.

THE CODLIN MOTH.

The common and familiar "apple-worm" is the caterpillar of the Codlin moth. It is the best-known and most widely spread of our apple pests, and causes great annual loss, not by totally destroying the fruit, but by greatly lowering its market value.

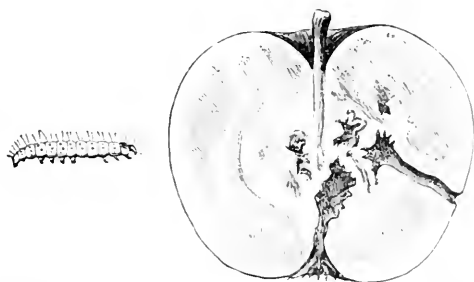


FIG. 4.—Fully-grown larva of the Codlin moth, and infested apple.

Life-history.—The moth appears in June, and lays eggs anywhere on the young fruit. The young caterpillars which hatch out enter the apples, usually at the "crown," but sometimes by cracks on the surface. After feeding in the "crown" for a few days, the grub bores straight for the core, where it spends most of the time (three or four weeks) that it passes within the apple. Before it is quite fully grown, it burrows a tunnel to the exterior, and in this tunnel it remains, a pinkish caterpillar about three-quarters of an inch long, till it is ready to turn to a chrysalis. Meanwhile the injury to the fruit has generally caused it to ripen prematurely and to fall. The caterpillar crawls out and seeks a shelter in which to spin its cocoon.

Treatment.—1. The first point to be attended to is the immediate gathering up and storing of "windfalls" which have dropped on account of the injury done by the grub. If they are allowed to remain beneath the trees the caterpillars come

out and turn to moths which set up future attacks. In a storage room in America used for this purpose, and having its windows screened with mosquito netting, nearly 16,000 Codlin moths were thus trapped and destroyed in one summer, instead of being allowed to lay their eggs on the fruit.

2. Spraying the very young fruit (a week after the falling of the blossom) with wash (*a*) or (*b*) is a measure which has been very successful in killing the young grubs at the time they are feeding in the "crown" of the fruit. Later it is useless, as it will not penetrate to the grub in the interior.

3. Bands of hay or rags tied round the trunks in July attract the caterpillars to spin their cocoons in them. They are removed in the autumn and destroyed with the cocoons they contain.

THE APPLE SAW-FLY.

The work of the Apple Saw-fly bears a rather close resemblance to that of the Codlin moth, with which it is no doubt frequently confounded. Nevertheless it is readily distinguished on careful examination.

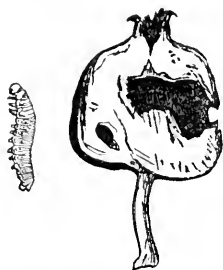


FIG. 5.—Larva of Apple Saw-fly (natural size) and injured apple.

Only the young fruit is attacked, and the borings are irregular, and rather in the form of large excavations. The injury is accompanied by a very disagreeable smell. The grubs, of which several may be found in the same apple, are of the regular saw-fly type, and may be distinguished from the Codlin caterpillar by their more numerous legs.

No moth caterpillar possesses more than five pairs of "sucker-feet" in the middle region of the body; the grub of the Apple Saw-fly has six.

Life-history.—The Apple Saw-fly is a four-winged, yellow-bodied insect of inconspicuous appearance, which appears in the middle of May. All insects of this group possess a peculiar apparatus in the form of a double saw—whence their popular name—by means of which they cut holes in leaves, stems, or fruit, for the reception of their eggs. By this the newly-set apples are pierced, and eggs inserted, the wound being distinguishable as a small orange-coloured spot.

The grubs which hatch out feed within the young fruit, but wander to adjacent apples if there is a likelihood of their original victim falling before they have attained their full growth.

When mature (early in July) they measure half an inch in length, and they then drop to the ground, and burrow to a depth of three or four inches, spinning cocoons, from which the saw-flies emerge in the following May. The actual pupa or chrysalis state seems to be short, and the insect spends the winter as a caterpillar within the cocoon. Grass orchards do not suffer so much as those in which the ground under the trees is cultivated.

Treatment.—The ground beneath infected trees must be treated in the autumn in some manner which shall prevent the grubs hiding there from turning to flies in the following spring. The particular measure adopted will depend upon the nature of the orchard, whether on grass land or bare soil. In the latter case the removal and deep burying of the surface soil is effective, and merely digging it up destroys many of the grubs. On grass, a heavy dressing of kainit might be useful.

THE PEAR MIDGE.

This is a pest which has been rather recently introduced into this country, but it has spread so widely and is so exceedingly destructive that it is well that fruit-growers should be on their guard against it.

The first symptom of attack is the stunted and misshapen appearance of the young pears in May. The injury has begun before this time, but it is not until the pears are about the size of cherries that anything wrong is noticed. If these misshapen and cracked pears are opened, numerous little white grubs are seen, much like cheese maggots, and having, like them, the power of jumping by placing head and tail together and separating with a spring.

Life-history.—The midge is a very small, black, gnat-like fly, which comes out in April. It lays eggs in the unopened flower-buds. The fruit is not prevented from "setting," as in the case of the apple-blossom weevil, but the maggots feed in the interior of the young pears, which are very soon checked in their development.

The grubs are full-fed at the end of May, but they do not always leave the fruit at once, often remaining there till well on in June, if the weather be dry. Rainy weather hastens their departure. They drop to the ground, over which they spread themselves by jumping, and burrow into the soil, to turn to chrysalids from which the flies come out in the following spring.



FIG. 6.—Pear infected by the pear midge, with one of the maggots natural size.

Treatment.—If the disease is confined to one or two trees, it is well to strip off *all* the fruit and burn it as soon as the attack is noticed, and before the maggots are ready to leave.

As in the case of the apple saw-fly, the pest remains hidden in the ground beneath the trees throughout the autumn and winter, and the measures to be taken for its destruction are the same in both cases.

IV. ORCHARD WOOD PESTS.

There are two different ways in which the wood of fruit trees may suffer injury. The bark may be smothered with “scale” or with “woolly aphids,” and diseased growths set up, or the wood may be tunnelled by the grubs of various insects. The bark-infesting insects are much alike in their mode of life and in the damage they do, and they may be dealt with together.

WOOLLY APHIDS (AMERICAN BLIGHT) AND MUSSEL SCALE.

These pests are too familiar to require description. Tufts of the woolly substance that indicates the presence of the aphid may be seen in any old and neglected orchard. It exudes from the bodies of the young insects. The little white specks, shaped like a mussel shell, scattered frequently over large areas of the bark, are the scales of the mussel-scale insect. Both do harm in two ways—by sucking the sap, and by choking up the bark and excluding light and air.

Treatment.—The blight or scale should be scraped off with a blunt knife as soon as observed, and strong soap-suds should be brushed well into the spot with a stiff brush. A stiff clay daubed on the affected parts will do almost as well. Judicious pruning is of great importance, admitting light and air to all the branches, and in the winter all loose bark should be scraped off from the trunks, which, together with the main roots, should be scrubbed well with soap-suds, or with the paraffin emulsion described in wash (c). For winter use, on the bark, the emulsion need not be greatly diluted, five gallons of water being sufficient for the three gallons of emulsion. The wash (c) is perhaps even more effective.

THE GOAT MOTH.

The trunks of apple and pear trees, as well as the willow, poplar, lime, etc., are often to be seen tunnelled by the borings of the large caterpillars of the Goat moth. The creature is known to be actively at work by the fresh “sawdust” which is continually being thrust out of the burrows. In bad attacks the

tree is completely riddled and killed by the grubs, whose borings pierce the solid wood in all directions, and give forth an unpleasant, goat-like smell.

Life-history.—The Goat moth is one of our largest British insects, measuring about $3\frac{1}{2}$ inches across the wings. Its general hue is brown, with black and white streaks and markings. It appears in July, and is not very easily seen, on account of its colour, on the bark of the trees, in the crannies of which it lays its eggs, choosing generally the lower part of the trunk. The caterpillars soon hatch out and eat into the wood, where they feed for three years, attaining a length of more than three inches when fully grown. They are dark red on the back and yellow or pink underneath.



FIG. 7.—Half-grown caterpillar of the Goat Moth.

When fully fed the caterpillar comes to the mouth of its burrow and spins a cocoon covered with particles of the "sawdust" caused by its borings, and from this cocoon the moth comes out in the summer of the fourth year.

Treatment.—1. Very badly infested trees had better be cut down and burnt, as they are probably doomed, and are a source of danger to other trees.

2. Many of the caterpillars may be hooked out or crushed by inserting a rather stout wire, hooked at the end, into their tunnels. Where these are too winding to allow the grubs to be reached, the following method is effective: The operator furnishes himself with a piece of stout wire, some cotton-wool, some putty, and a bottle of strong ammonia solution. The tunnels are cleared of sawdust as far as possible, and cotton-wool soaked in ammonia rammed up them as far as it will go, the orifice being then plugged up with putty. A plentiful dose of ammonia must be given, and any neighbouring holes which may possibly be in communication must be also plugged. The fumes will generally prove fatal to the imprisoned grub, whose death may be inferred from the cessation of the output of sawdust.

3. Where the moth is known to be about, it may be kept from laying eggs on the trunks by painting the lower portions of them in July with thick soap-suds, or with any ill-smelling preparation. A mixture of clay and cow-dung is said to be effective for this purpose.

4. Wherever the chrysalids are seen protruding from the mouths of the burrows, they should be hooked out and destroyed before the moth comes out. They are most readily found in June.

THE LEOPARD MOTH.

The caterpillar of this moth has the same habits as that of the Goat moth, tunnelling the wood of apple and pear and also of plum trees. It is very different in appearance, however, being yellow with numerous black spots, and the moth itself is a handsome insect with large white wings thickly dotted with black. There is no characteristic smell, and the harm done is seldom very serious.

Treatment.—The same as for the Goat moth.



FIG. 8. Leopard Moth caterpillar in a pear branch.

V. BUSH-FRUIT PESTS.

CURRANT AND GOOSEBERRY
MOTH. MAGPIE MOTH.

Everyone is familiar with the prettily marked Magpie moth, with its colouring of yellow, black and white, and with the similarly coloured looper caterpillar to which it gives rise.

Life-history.—The moths, which are very butterfly-like in appearance, come out in the hot summer weather, and lay their eggs on the leaves of currant and gooseberry bushes. The caterpillars are found feeding on the leaves in August and September, after which, instead of turning at once to chrysalids, they hide themselves away for the winter in the caterpillar state, being often concealed in dead leaves on or under the bushes, or hidden under any convenient shelter near at hand. They come out of their hiding-places and continue feeding in the following May, turning to chrysalids at the end of that month or in the beginning of June, and from these the moths come out in July.

Remedies.—1. Hand-picking. This is facilitated by jarring the bushes, when the caterpillars let themselves down by a thread, and are more easily seen.

2. Dressing with wash (c), or with powdered hellebore.

Hellebore is poisonous, and should not be used very near the time of picking the fruit.

Prevention.—1. In the case of a sheltered garden, or of bushes trained on walls, much benefit results from seeking out and destroying the chrysalids in the first week in June. Quantities of them may be found under window-stones, the beams of railings, &c., in the neighbourhood of the plants.

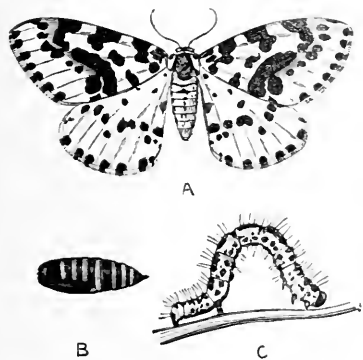


FIG. 9.—A. Magpie Moth; B. Chrysalis; C. Caterpillar.

2. In the late autumn, when all the leaves have fallen, the bushes should be carefully gone over, and dead leaves which may contain the caterpillars removed, as well as any rubbish likely to afford shelter on the ground beneath.

3. Pieces of matting, or tiles, may be left designedly, to induce the caterpillars to winter underneath them. They must be taken up in the winter, and the hibernating caterpillars destroyed.

GOOSEBERRY AND CURRANT SAW-FLY.

The grubs of this insect do a very great amount of damage in a wonderfully short time, generally during May or June. These caterpillars cannot be confounded with those of the Magpie moth, for their colouring is quite different, and they are not “loopers,” but have a large number of legs—seven pairs of sucker-feet, in addition to the three pairs of claw-feet in front. They alter a good deal in appearance as they grow, but their general hue is green, speckled with black dots as they become older. When fully grown they only measure about an inch in length.

Life-history.—The parent of the grub is not a moth, but a yellowish fly-like insect, about the size of a small house-fly. It comes out in May, and pierces little holes in the leaves in which to place its eggs. These hatch in a few days, and the caterpillars grow rapidly, and quickly eat away every part of the leaves except the veins. They then drop to the ground and make little earth-covered cocoons about an inch beneath the surface. From these some of the flies come out in about three

weeks and continue the attack, but most remain in the earth till the following spring.

Remedies.—The same as for the Magpie moth.

Prevention.—This pest can be exterminated with comparative ease by taking advantage of the fact that the cocoons remain in the ground, near the surface, during the whole winter. The simplest treatment is to remove the surface earth beneath the bushes to a depth of two or three inches in the winter, and to bury it deeply in a hole dug in some part of the ground.



FIG. 10.—A, Gooseberry Saw-fly, enlarged. The natural size is shown above. B, Caterpillar. C, Chrysalis in a dead leaf.

CURRENT CLEAR-WING MOTH.

Sometimes the shoots of the currant plant—especially the black currant—begin to fail without any obvious cause; but if they are cut off, they are found to be tunnelled all along the centre, and the pith entirely eaten away. This is the work of the Currant Clear-wing moth, which occasionally does serious harm in fruit gardens.

Life-history.—The insect is one of the group of moths called Clear-wings because the greater part of the wings is transparent, and not covered with scales like those of most moths. This gives it a very unmothlike appearance, and a certain resemblance to insects of the wasp tribe.

The moth lays its eggs near the buds, and the caterpillars eat their way into the interior of the shoots, where they live upon the pith, causing the leaves to wither and the shoots to die.

Treatment.—The disease is most likely to be noticed when cuttings are being taken or when the bushes are being pruned.

If the shoots, or cuttings, are noticed to be tunnelled down the centre, they should be removed to the very bottom, and carefully burnt.

If currant shoots show signs of dying for no apparent reason, this pest should be suspected and looked for, and the bush carefully pruned.

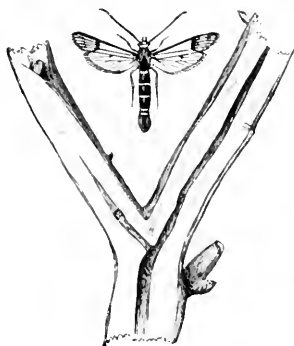


FIG. 11.—Currant Clear-wing Moth, and branch of infested currant bush cut open to show the injury.

BLACK-CURRENT GALL-MITE. BIG BUD.

For many years past an increasing amount of damage to black currants has resulted from the disease known as "Big Bud," and it is now one of the most serious causes of loss to the fruit-grower. The swollen and distorted buds which are characteristic of the disease are only too familiar throughout the country. The cause of injury is a creature too small to be seen clearly by the naked eye, but if a diseased bud is examined under the microscope, it is found to contain myriads of little white worm-like animals known as *mites*.

Life-history.—In the winter buds containing the mites are found on the infested bushes. If the buds are only slightly diseased, they manage to develop, and the mites are turned out and die; but the badly diseased buds do not open at all, but remain closed and swollen on the shoots till they dry up and die in June. Just before they dry up the mites come out and disperse themselves, some crawling away, and some attaching themselves to passing insects. The few that find their way to the new buds which are just beginning to swell continue the disease; the rest all perish. The mites multiply with great

rapidity, laying eggs all the year round, except, perhaps, in the early part of January. The creatures are least numerous in the

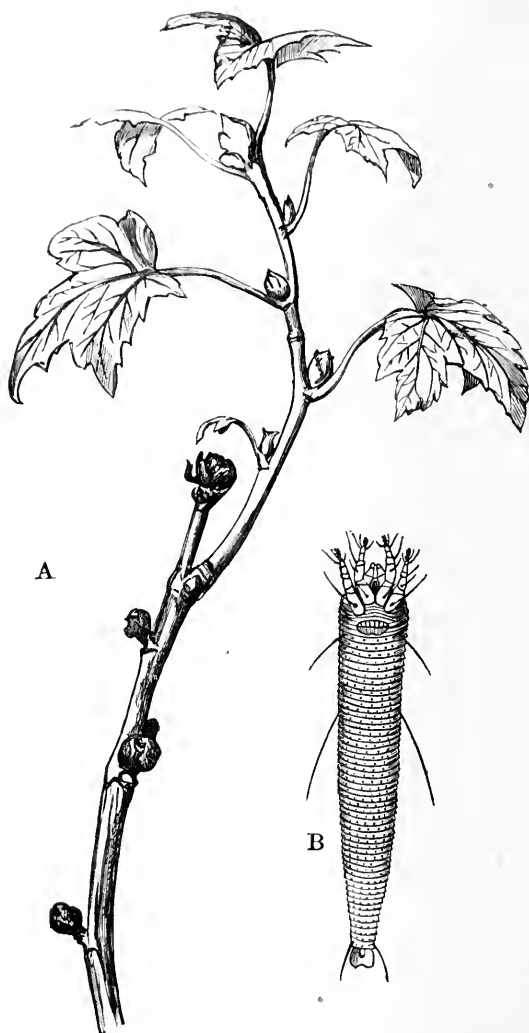


FIG. 12.—A, infested black-currant twig, showing old wood with dead buds, and new wood with sound and diseased buds. B, the mite enlarged about 200 times, ventral view.

beginning of June, when they have been obliged to leave the old buds, and all have perished except those which have been

fortunate enough to reach the new buds, but have not yet had time to multiply.

Treatment.—No method of exterminating the pest has yet been found. It is so well sheltered within the buds that spraying does not affect it, and methods which kill the mites do not destroy the eggs. There are certain measures which diminish the disease, but the results obtained by them are by no means uniform.

1. The mites (but not the eggs) can be killed by subjecting the bushes to fumigation, under a waterproof tent, by hydrocyanic acid; but this is so deadly a poison that the fumigation should not be attempted by any but an expert.

2. Severe and repeated pruning, taking care to burn the cuttings, has in some cases proved very beneficial.

3. Picking off diseased buds in the winter has sometimes considerably lessened the disease, but in other cases it has seemed to be without effect.

It is of the greatest importance, in planting out blackcurrants, to obtain cuttings free from the mite, and cuttings should not be purchased unless the buyer has expert evidence that the bushes from which they are taken are clean.

Some varieties suffer more than others. Baldwins, Black Naples, and Prolifics are often badly diseased. Carter's Champions resisted the disease for some time, but now they are frequently attacked. Varieties with hard, closely wrapped buds are less easy of access to the mite. Though it is not quite clear what practical use can be made of the fact, it is worth while remembering that at the beginning of June the mites are far less numerous on an infested bush than at any other time of the year.

THE RASPBERRY BEETLE.

A great many fruit-growers are troubled by the occurrence of maggots in the fruit of their raspberries. It is then too late to take any effective steps against the attack. But if it is one that occurs annually, it is worth while knowing that it can be much diminished by adopting proper measures when the bushes are in blossom. The grubs are those of the Raspberry beetle, which attacks the opening flower-buds, sometimes so severely that the fruit is quite prevented from developing.

Life-history.—This insect is a small brown beetle, about one-sixth of an inch in length, which may be found attacking the flower-buds of the raspberry at the end of May or the beginning of June. In addition to the harm they do by their feeding, they lay eggs in the buds, and the grubs which hatch

out feed on the fruit which has escaped destruction by the beetle. When fully grown they are yellowish grubs, about a quarter of an inch long, with six fairly long legs, and they now crawl away to some convenient shelter, such as a cranny in the bark, and turn to chrysalids, in which state they pass the winter, coming out as beetles in the following spring.

Treatment.—A great many beetles may be destroyed and the damage done by them much reduced by jarring the bushes, when in blossom, over tarred boards or sacks steeped in paraffin. This should be done not only when the attack is so severe as to attract attention by the destruction of the blossom, but in all fruit gardens where the raspberries are annually more or less maggoty; and the operation should be performed on dull days, or early in the morning, for in sunshine the beetles fly actively, and many would escape.

Very badly infested fruit should be gathered and burnt before the maggots leave for their winter quarters.

Many of the chrysalids would be destroyed if the trimmings cut away in the ordinary winter treatment of the bushes were collected and burnt instead of being merely thrown aside.

CECIL WARBURTON.

ZOOLOGICAL LABORATORY, CAMBRIDGE.

July 1902.

PUBLICATIONS

RELATING TO

FRUITS, VEGETABLES, &c.,

ISSUED BY THE

Royal Agricultural Society of England.

.....

PAMPHLETS.

*(Obtainable at the Society's House, 13 Hanover Square, London, W.,
or of Mr. John Murray, 50a Albemarle Street, W.)*

Hints on Vegetable and Fruit Farming.

By CHARLES WHITEHEAD, F.L.S., F.G.S. Fourth and Enlarged Edition (1893). With 7 Illustrations. 53 pp. Price 6d.

Methods of Preventing and Checking the Attacks of Insects and Fungi.

By CHARLES WHITEHEAD, F.L.S., F.G.S. With 26 Illustrations (1891). 40 pp. Price 6d.

Hop Cultivation.

By CHARLES WHITEHEAD, F.L.S., F.G.S. With 13 Illustrations (1893). 48 pp. Price 1s.

Orchard and Bush-Fruit Pests and How to Combat Them.

By CECIL WARBURTON, M.A., F.Z.S. (1902). 20 pp. Price 6d.

The Drying of Fruit and Vegetables.

By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 4 Illustrations (1897). 24 pp. Price 3d.

COLOURED DIAGRAMS.

(Obtainable from Messrs. W. & A. K. Johnston, Limited, 7 Paternoster Square, E.C., and Edinburgh.)

Diagrams of Injurious Insects.

Drawn from Nature by the late Miss GEORGINA E. ORMEROD, in conjunction with the late Miss ELEANOR A. ORMEROD, F.R.Met.Soc. Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d.

Eight Diagrams Representing the Life History of the Wheat Plant

(after FRANK FAULKNER). With Explanatory Pamphlet by W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet), 10s. per Set of 8 Diagrams.

The Potato Disease.

By W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

PUBLICATIONS

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

JOURNAL OF THE SOCIETY.

Now published Annually as a Bound Volume of about 600 pages.
Free to Members; Price to Non-Members, Twelve Shillings.

TEXT-BOOK ON AGRICULTURE.

ELEMENTS OF AGRICULTURE: a Text-Book prepared under the authority of the Royal Agricultural Society of England by W. FREAM, LL.D. 486 pp. with 256 Illustrations. Seventh Edition (Thirtieth Thousand) 1902. Price 3s. 6d. bound in cloth.

PAMPHLETS.

VETERINARY PAMPHLETS BY PROFESSOR SIR GEORGE BROWN, C.B.:

DENTITION AS INDICATIVE OF THE AGE OF FARM ANIMALS. Fifth Edition (1902). 64 pp. With 60 Illustrations. Price 1s.

ANIMALS OF THE FARM IN HEALTH AND DISEASE. 72 pp. With 52 Illustrations. Third Edition (1895). Price 1s.

THE STRUCTURE OF THE HORSE'S FOOT AND THE PRINCIPLES OF SHOEING. 21 pp. Fourth and Enlarged Edition (1902). With Twelve Illustrations. Price 6d.

CONTAGIOUS FOOT-ROT IN SHEEP (1892). 16 pp. With 8 Illustrations. Price 6d.

OTHER VETERINARY PAMPHLETS:

THE MARE AND FOAL. By Professor J. WORTLEY AXE, M.R.C.V.S. 58 pp. With Twenty Illustrations (1898). Price 1s.

THE LAMBING PEN. By HAROLD LEENEY. Third Edition (1897). With 9 Illustrations. Price 6d.

PAMPHLETS BY MR. CHARLES WHITEHEAD, F.L.S., F.G.S.:

HINTS ON VEGETABLE AND FRUIT FARMING. Fourth and Enlarged Edition (1893). With Seven Illustrations. 53 pp. Price 6d.

METHODS OF PREVENTING AND CHECKING THE ATTACKS OF INSECTS AND FUNGI. With Twenty six Illustrations (1891). 40 pp. Price 6d.

HOP CULTIVATION. With Thirteen Illustrations (1893). 48 pp. Price 1s.

DAIRY PAMPHLETS:

(Issued under the authority of the Dairy Committee of the Society.)

THE PRACTICE OF (a) CHEDDAR, (b) CHESHIRE, AND (c) STILTON CHEESE MAKING. Price 2d. each.

SIMPLE RULES FOR BUTTER MAKING. Revised May, 1896. (Sheet.) Price 1d. each, or 5s. per 100. Mounted on card and varnished, to hang up in the Dairy, 6d. each.

(These Rules can also be had in the Welsh Language.)

OTHER PAMPHLETS:

TABLES FOR ESTIMATING DEAD WEIGHT AND VALUE OF CATTLE FROM LIVE WEIGHT. By the late Sir JOHN B. LAWES, Bart. Price 1s.

ORCHARD AND BUSH-FRUIT PESTS AND HOW TO COMBAT THEM. By CECIL WARBURTON, M.A., F.Z.S. (1902). 20 pp. Price 6d.

THE DRYING OF FRUIT AND VEGETABLES. By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 4 Illustrations (1897). 24 pp. Price 3d.

REPORT ON THE WOBURN POT-CULTURE STATION. By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 17 Illustrations (1900). 52 pp. Price 2s. 6d.

THE WOBURN EXPERIMENTAL STATION OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND. Report on Field, Feeding, and Pot-Culture Experiments (1899-1901). By J. AUGUSTUS VOELCKER, M.A., B.Sc., Ph.D. With 27 Illustrations (1902). 92 pp. Price 1s.

HEDGES AND HEDGE MAKING. By W. J. MALDEN. With 10 Illustrations (1899). 32 pp. Price 6d.

THE MAKING OF THE LAND IN ENGLAND. By ALBERT PELL. (1899.) 27 pp. Price 6d.

COTTAGE SANITATION IN RURAL DISTRICTS. By H. MACLEAN WILSON, M.D., B.Sc. With a Preface by T. PRIDGIN TEALE, F.R.S. New and Enlarged Edition. 32 pp., 12 Illustrations (1896). Price 3d. per copy; 2s. per doz.; 12s. 6d. per 100.

THE AGRICULTURAL HOLDINGS ACT, 1900. By S. B. L. DRUCE. Second and Enlarged Edition (1901). 38 pp. Price 6d.

The above can be obtained at the Society's House, 13 Hanover Square, London, W.; or of Mr. JOHN MURRAY, 50a Albemarle Street, W.

COLOURED DIAGRAMS.

(Obtainable from Messrs. W. & A. K. Johnston, Limited, 7 Paternoster Square, E.C., and Edinburgh.)

DIAGRAMS OF INJURIOUS INSECTS. Drawn from Nature by the late Miss GEORGIANA E. ORMERON, in conjunction with the late Miss ELEANOR A. ORMERON, F.R.Met.Soc. Price 1s. 6d. each. Varnished and mounted on canvas, with rollers, 2s. 6d.

EIGHT DIAGRAMS REPRESENTING THE LIFE HISTORY OF THE WHEAT PLANT (after FRANCIS BAUER). With Explanatory Pamphlet by W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price (including Pamphlet) 10s. per Set of Eight Diagrams.

THE POTATO DISEASE. By W. CARRUTHERS, F.R.S., Consulting Botanist to the Society. Price 1s.

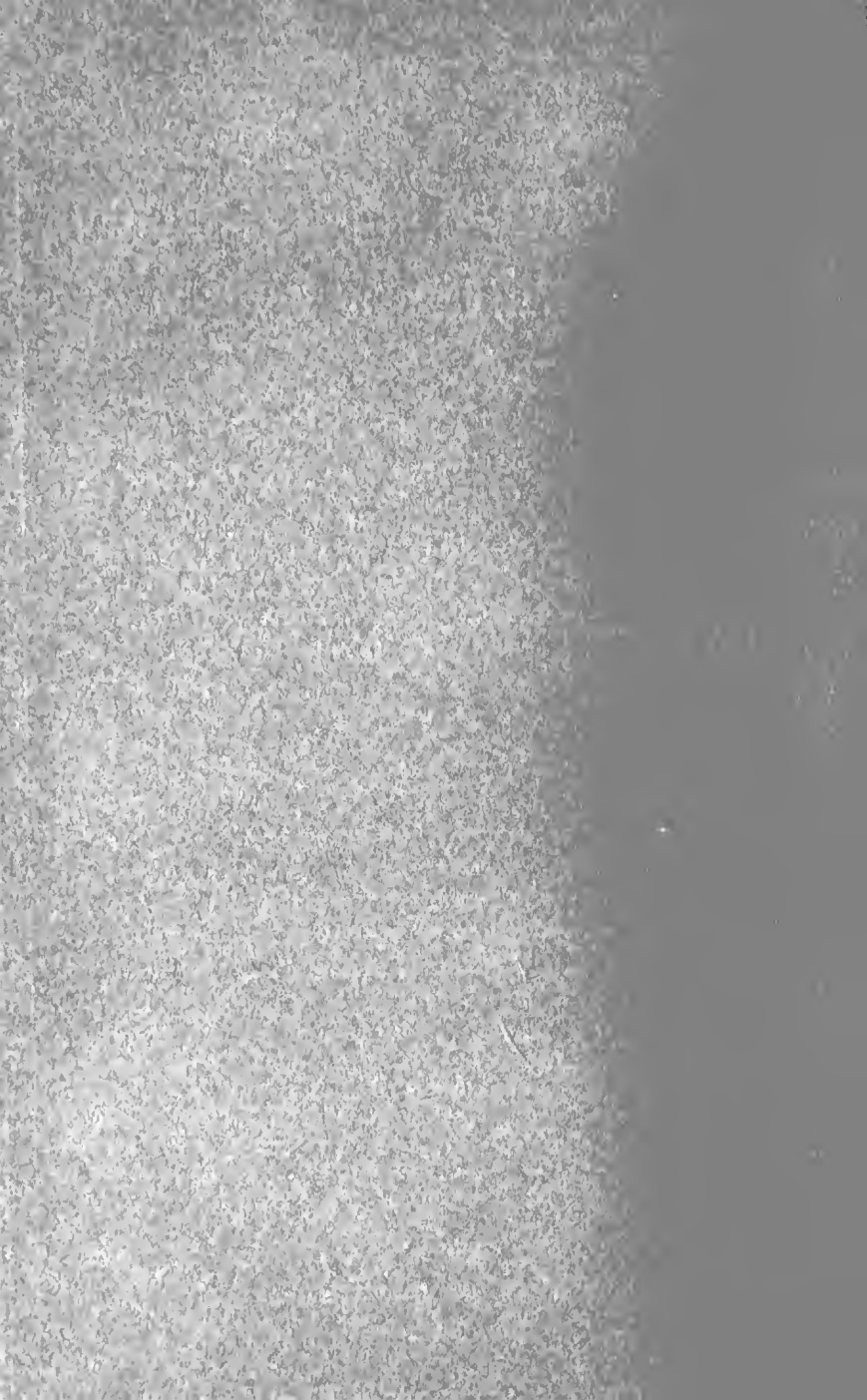
SUGGESTIONS FOR STOCK-FEEDING IN THE WINTER OF 1893-94.

BY

- | | |
|---------------------------|----------------------|
| (1) THE EDITOR. | (6) H. SIMMONS. |
| (2) JOHN FRANCIS BEDDALL. | (7) ALFRED J. SMITH. |
| (3) T. R. HULBERT. | (8) TOM T. STACEY. |
| (4) CLARE SEWELL READ. | (9) THOS. STIRTON. |
| (5) J. P. SHELDON. | (10) R. STRATTON. |

FROM THE
JOURNAL OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND,
VOL. IV. THIRD SERIES, PART III.

Printed by
SPOTTISWOODE & CO., NEW-STREET SQUARE, LONDON.
1893.



SUGGESTIONS FOR STOCK-FEEDING IN THE WINTER OF 1893-94.

I.

How to meet the winter is a problem which can never have caused stock-feeders more anxious thought than at the present time, after the disastrous spring and early summer drought, which must always render the year 1893 alike memorable and exceptional. In due time it will, no doubt, be desirable to write the history of the approaching winter of 1893-94, and such history, based upon experience, will possess the value of a permanent record, access to which will always be possible. On this occasion, however, and in view of the fodder famine which, in many districts, seems imminent, an attempt has been made to anticipate the trying time that lies ahead, and to place at the disposal of stock-feeders various suggestions, the adoption of one or more of which may, it is hoped, serve to alleviate the distress which the winter cannot fail to bring with it.

A characteristic feature of the recent drought was its unequal distribution, not merely within the island of Great Britain, but even within the limits of England and Wales. In the paper entitled "The Spring Drought of 1893," which Mr. G. J. Symons, F.R.S., has contributed to this volume of the *Journal*, it is stated (p. 354) that the area over which the drought has been severe is that south-east of a line joining Cardiff to Hull. If there be laid upon the map a rule, the edges of which touch Cardiff and Hull, it will be seen that the

drought-stricken area embraces about twenty counties. It is within this area, which includes the Eastern, Southern, Western, and part of the Midland counties of England, that the pinch of the coming winter will be most severely felt.

Accordingly, it is from practical men dwelling within this south-eastern half of England that the suggestions contained in the following pages have been drawn. There is embodied in these suggestions nothing that is either theoretical on the one hand, or beyond the limits or capacity of the ordinary stock-feeder on the other, and their intrinsic value cannot but be increased by the fact that they all emanate from men each of whom has to face the winter problem himself. For convenience of reference the names of the authors are here given in alphabetical order, whilst the numbers indicate the sequence in which their several communications are presented to the reader :—

- II. Mr. J. F. BEDDALL, Marston Park, Amptill, Beds.
- III. Mr. T. R. HULBERT, North Cerney, Cirencester, Glos.
- IV. Mr. CLARE SEWELL READ, Honingham Thorpe, Norfolk.
- V. Professor J. P. SHELDON, Sheen, Ashbourne (Staffs).
- VI. Mr. H. SIMMONS, Bearwood Farm, Wokingham, Berks.
- VII. Mr. ALFRED J. SMITH, Rendlesham, Woodbridge, Suffolk.
- VIII. Mr. TOM T. STACEY, Winterbourne Kingston, Blandford, Dorset.
- IX. Mr. THOMAS STIRTON, Stratton, Micheldever, Hants.
- X. Mr. RICHARD STRATTON, The Duffryn, Newport, Mon.

In the course of the inquiry I received various letters, from several of which serviceable extracts may be made, and these may appropriately appear at this stage.

An extensive breeder and feeder, and successful exhibitor of stock, dwelling in Kent, but who has also had considerable experience elsewhere, says :—

Last winter I used a great quantity of dried grains with success, and this year I am thinking of steaming mixed hay and straw with different kinds of meal, and thus as far as possible both economising the fodder crops and supplying the moisture which we lose through the deficient root-crops. Molasses may be of use in this direction.

The point, however, which exercises me most is that I should like to feed this steamed mixture *warm*, if not *hot*, to the stock, and I am not clear how such beasts, especially the store cattle, can stand this, unless they are in covered courts—which, again, I do not think very good for them. We might possibly meet the case by feeding them with dry artificial food outside during the day, and giving them a “boiling” at night under cover.

I feel sure of moderate success with fat cattle, but I apprehend some difficulty with regard to store cattle, more especially as it will not be easy to hit the happy medium in the quantity it will pay to give them.

No doubt, while the late grass lasts, it will be necessary to keep every-

thing out of doors as long as we can, and I look forward somewhat hopefully to being able to meet half-way, so to speak, the spring catch crops.

I do not think that the *bulking* value of straw is well understood in some parts of England. If a good flavour is imparted to the straw by the steamed mixture I suggest, a considerable saving may be effected by using as much of it as can be spared for fodder instead of for bedding, while those people who have access to rushes, flags, bracken, heather, bent, &c., are in much better case than those who have not such material to fall back upon, and they should not miss any opportunity which may offer itself of preparing and using such waste products as bedding.

In spite of scarcity, many farmers are apt to use their straw in the ordinary way, though perhaps more sparingly, and then resort to makeshifts when it is finished. This, however, should not be. I would rather say, begin at once, and rigidly enforce entire abstinence from straw, except as a food, and then only *chopped*, and, as I have said, steamed and flavoured. Then, I believe that, with care, and looking forward to early spring crops, we may weather the winter, though undoubtedly it must be one of the most trying the British farmer has ever had to encounter.

The next communication is from a farmer in the Fens, who has to carry a large number of cattle through the winter with only half the usual amount of straw and clover hay, and no roots:—

I would suggest that stock be kept out of doors, weather permitting, as far as possible into the autumn—in the droughty year of 1868 our autumn keep was very abundant. After that, the only advice I could give would be to purchase the cheapest feeding stuffs procurable in each farmer's immediate neighbourhood, taking bulk into consideration—dried grains, for example, where there is not too much carriage to pay. Keep the beasts out on the grass as long as practicable, and then in covered yards or hovels. Cut into chaff all the oat-straw and part of the wheat-straw, steaming the latter to make it more readily digestible. Practise the greatest economy in every direction.

A successful farmer, of nearly half-a-century's experience in stock-breeding, writes as follows from the water-meadows district of Wiltshire:—

The wintering of stock is most important work at all times, and must especially be carried out with anxious care by the feeder who is called upon to face the winter on short commons in such a season as the present.

Those who supplement their failing pastures in good time will effect a great saving of food hereafter, by prolonging the period during which the stock may be kept out, as well as preserving their health. A moderate feed in early morning will help in this direction, and nothing, I think, is better for the purpose than chaff with a mixture of meal, consisting of two parts of thin sweet barley to one of old beans finely ground. The time to begin must be influenced by the condition of the pastures and the state of the weather; but it would be well to be prepared to commence with the usual October rains, or at any rate not after the white frosts of November, or the cattle may be chilled, and sheep lost from water on the chest.

Such feeding will probably carry stock in health till near Christmas, when, if fodder is to be made the most of, they must be put into winter quarters, whilst those who are better acquainted with the chaff-cutter than I

am are more fitted to give advice thereon. Therefore, I pass over the next few weeks in silence, as they embrace a period which has never given me such great anxiety or trouble as is referred to in the old couplet—

March will search, and April try,
But May's the month your cattle die.

If kept on short commons, dry husky fodder must be avoided. As stock crave for dry, warm, stimulating food in early winter, so they pine for moist, nourishing, digestible food in spring. Nothing, in my opinion, meets the requirement like sweet chaff with the best linseed cake. Such food will maintain health through March, and ward off red water and blain on turning out in April and May. But this feeding must not be stopped hastily. "Two flails and the cuckoo going together" have gladdened the heart of many a husbandman,—it means a bit of corn and fodder to finish the winter season.

The last communication I need quote is from a correspondent who has for the last twenty years farmed nearly 1,500 acres on the borders of Somerset and Wiltshire :—

My own plan, when short of keep, is to put in as much rye as possible. My sheep were feeding on rye last winter from November till April, and did well on it with $\frac{1}{2}$ lb. cake. For dry food I have found Mr. Jonas's plan, described in your Journal,¹ a very good one: that is, cutting green oats, grass or clover, with straw, two men putting up the straw and a boy the green stuff. In the droughty year of 1868 I had a lot of stuff put away by the same method for the winter, but was so short of keep that my ewes ate it in July.

With regard to the use of linseed oil as food for stock, I am indebted to General Viscount Bridport, G.C.B., for the details of management on his home farm at Cricket St. Thomas, Somerset, where this material is employed in winter feeding with highly satisfactory results. The method followed is to mix one quart of linseed oil with one gallon of boiling water. This is poured from a watering-pot with rose over a heap of about four bushels of chaff. It is found convenient to make the mixture the day previous to use, and the quantity mentioned is enough for eight beasts. All kinds of stock, however—horses, cattle, and sheep—were fed last winter in this way, and throughout the season the horses were free from colic or gripes. The oil was bought in London at 1s. 11d. a gallon, free on rail, and was sent out in tins and barrels. Calling the price 2s. a gallon, one quart would cost 6d.; and as this is sufficient for a meal for eight beasts, the outlay for oil would be $\frac{3}{4}$ d. per head. Linseed oil will continue to be used on Lord Bridport's farm throughout the coming winter, as experience proves that a considerable saving in the food bill is thereby effected.

It will be found, in the succeeding pages, that the use of straw as bedding or litter, in such a season as the present, is condemned

¹ *Straw Chaff*, by Samuel Jonas. Journal (2nd Series), Vol. VI., 1870.

by most of the authors. Various substitutes for ordinary litter are suggested, and it may therefore be useful to state that an investigation conducted at the Jönköping Experiment Station, Sweden, in 1891, into the absorptive power of materials used for stable-bedding, gave the following results, the numbers showing how many times its own weight of water the water-free sample of each material absorbed :—

Heath litter . . 3·2	Wheat straw . . 3·9	Oak leaves . . 3·7
Oak shavings . . 3·9	Oat straw . . 4·1	Birch leaves . . 4·5
Pine shavings . . 4·0	Barley straw . . 4·3	Moor earth . . 15·1
Birch shavings . . 5·3	Rye straw . . 4·9	Peat 16·9

The papers which follow have not been written upon any set or uniform plan, nor have they arisen in response to a stereotyped schedule of questions. Rather are they the spontaneous utterances of the practical men who have been good enough to write them, and they thus possess a freshness and an originality which could hardly otherwise have been attained. Though in the main anticipatory, they are necessarily at the outset somewhat retrospective in character. Moreover, as a local flavour to the opinions expressed, and to the practices advocated, is by no means inconsistent with the object in view, it will be useful to associate each author with the district from which he writes. The critical reader will be prepared, then, to look for differences of opinion, such as are bound to find expression when localities as far apart as Monmouth and Suffolk, or as Dorset and Norfolk, are brought under notice. Furthermore, it is well to remember that the papers were written at the beginning of September, as several references are made to the date current at the time.

It is in the hope that stock-feeders may find suggested, amongst the following communications, methods which might be usefully incorporated with their own winter practice, that these papers are laid before them. I am tempted to summarise, if ever so briefly, the salient points which are set forth by the several writers. I feel, however, that I should be doing the reader but an ill-service were I to stand longer between him and those who have kindly enunciated a series of practicable proposals, based upon actual experience, for carrying live stock through what is bound to be, even at the best, an unusually difficult and trying winter.

W. FREAM.

II.

The majority of farmers in the Eastern and Midland counties enter upon the winter with comparatively nothing at command

in the shape of either hay, straw, or roots. Many will undoubtedly be compelled to sell stock at half their average value. Others more fortunately placed will probably make desperate efforts to retain animals which in numberless instances could hardly be replaced; being the result of many years' judicious selection and breeding, to suit the requirements of the soil and locality. Very little can be done at the end of September, by way of making provision for late or early keeping; our seedsmen, however, testify to the fact that the advice given on all sides to shorten the winter in this way has been generally followed.

In offering a few suggestions as to how an ordinary cultivator, of perhaps limited means, may cast about to his advantage, I am primarily impressed with the idea that, should the winter be ever so favourable, there is not on hundreds of occupations sufficient bulky feeding material to combine with such alimentary constituents as it may be within the farmer's means to supply, or purchase, for his cattle. This being the case, there will be next to nothing to spare for bedding or litter, even inside the buildings. Probably every known substitute available, locally or otherwise, will be requisitioned, and peat moss litter will be largely bought. In nine cases out of ten, as the cost of haulage will put this out of the range of ordinary farmers, experience indicates that dry earth may be stored for use with advantage. In proof of this,—our circumstances on 800 acres being those indicated above,—a large number of sows and pigs and weaning calves (the only stock under cover) have for the past three months had nothing else, thereby saving a considerable bulk of straw.

The use of burnt earth or clay, the efficacy of which as a mechanical and manurial improvement to stiff clay land is universally acknowledged, was advocated in the *Journal* forty years ago by the late Dr. Voelcher, and since then by many able writers, including Lawes, Mechi and others, as one of the best absorbents and deodorisers, when used as bedding for stock. It appears to commend itself in this time of scarcity as the cheapest and healthiest layer for any kind of stock, and when its subsequent value as a manure is considered, it will be seen that a moderate outlay made in burning some handy hillock, or headland, with the aid of useless old pollards or other waste wood, or fine coal (if cheap and easily available), would furnish a valuable addition to the supply of manure in a season which will find it woefully deficient.

The cost of burning will vary from 8*d.* to 1*s.* per yard, and care should be taken not to get the heap too big or too hot, when

clays run together. Even these brick-like lumps may be turned to account in road-mending and in other ways. The burning of a headland may be continuous, leaving a heap the size and shape of a mangel clamp, which should be lightly thatched from day to day when sufficiently cool. Useful bedding is available on some farms from patches of low-lying moorland, and where sandpits are handy, or spent bark or other waste is available, they will probably be turned to account. Sparred floors are successfully used, and if the brick floors of pigsties, &c., be cheaply lined over with old sleepers or boards, it will save half the otherwise necessary bedding.

Having thus proposed to conserve the straw by the use of a substitute, the manufacture of which may probably be worked in the ordinary farm labour account, it will be necessary to consider the most economical and profitable method of utilising the straw, both in the replacement of hay and as the accompaniment of more concentrated foods. The necessity of a proper distension of the stomach in the case of cattle and sheep is an elementary fact known from experience to every practical man. A case occurred within the writer's recollection, some years ago, in which a London trader (having constituted himself a "farmer") was prosecuted, convicted, and fined for cruelty to his cattle (although it was in evidence that a good stock of cake and corn was warehoused on the farm, and that the cattle had plenty of it), simply because, in spite of neighbourly advice, he ignored the fact that a coefficient was required in the shape of bulk.

This department has been well handled by able writers in these pages, and in different publications, for many years, so that it is unnecessary in these days to occupy space with any attempt to prove the value of straw as food. Many feeders, having foreseen the necessity for its increased use long before harvest, will have cut such crops as are better suited to supply it at the earliest possible moment, thereby ensuring the largest proportion of nutritive properties in the straw. Being thus prepared, experience indicates that it is best to reduce the straw to chaff as soon after harvest as possible, in order that it may be properly ripened for use. The cheapest method, and one which has practically superseded all others, is to cut all up at one operation by attaching the cutter to the threshing machine, and mixing the corn and straw chaff together. Our practice for many years has been to cut up the largest possible quantity of all kinds of straw, and store it in a convenient position in the homestead, and, if possible, in the "bay" of a large old-fashioned barn, capable of holding from one to six days' work, according to requirements. The chief point to be aimed at is *consolidation*,

which is attained by treading by men or boys, but better still by horse labour in the same way as barley is frequently treated. If the chaff is carried up an incline (which can subsequently be thrown up or removed), extending along the barn floor or "midstry," the horses can walk off and on, and be kept at it till the work is completed, or as long as they can walk under the roof. The admixture of a pint of salt per bag, and a limited quantity of green fodder cut with the straw the first two or three hours, or in winter some pulped roots, will quicken and increase fermentation, which will render the chaff when cooled down and ripe (in, say, a month) more digestible and acceptable all round, also a safer and better accompaniment to the food of all stock. It may, when so treated, be given to horses with impunity, care being taken to avoid gripes by selecting for them the interior of the heap, and by making any change gradually. A proportion of bran, a few roots, or, where neither are available, an ounce per day each of linseed oil poured over the feed, is advisable where it is found absolutely necessary to use fresh straw chaff for horses without hay.

When preparing the "mixing," should (as will undoubtedly often be the case) the supply of roots fall short, soups may be made with *boiling* water, treacle, sugar, linseed, or meal, and poured over the chaff. If the different feeding-stuffs are in this way well mixed, *the day before* the heap is required for use, the food will have an appetising aroma and digestibility, which will render the expense and trouble of steaming, cooking, or condiments unnecessary.

The present low price of wheat—26s. per quarter—will undoubtedly lead to its increased use as food for stock. The old prejudice against its consumption on the farm—founded, probably, on the unsatisfactory results of injudicious administration—is fast disappearing, and it cannot be too widely known that a proportion of one-third mixed and ground with cake, maize, oats, and other corn has been continuously and successfully used for two years past on many large farms, the meal so produced proving a cheaper and more nutritious food than either used alone. For horses or colts the proportion should not exceed one-fourth of the whole, and is best "grittled." Good results have been obtained on small occupations by boiling wheat, and many affirm that it is best thus prepared, especially for pigs.

Probably there will be a run on all such bulky foods as dried grains, malt combs, rice meal, bran, &c. Dried or desiccated grains seem to be steadily increasing in favour. Several good practical men have already laid in a store, and when damped

down with boiling water or steamed the day before being incorporated with the "mixing" above described, we have by different practical comparisons found them a cheap, palatable, and nutritious auxiliary. When fed in a dry state, they did not appear to be worth much more than our properly-prepared chaff.

As a matter rather out of the reach of farmers, on account of the expensive machinery required, I may say that in the course of an endeavour to get information as to continental systems of winter feeding, I have received a letter from M. Grimaldi, of Milan, who has probably given as much attention to food-preparing machinery as any man in the world. He informs me that the machine for reducing straw to pulp (first made under his patent by Messrs. Garrett in 1884) is largely used in Italy and other southern countries, that cattle are chiefly fed on this pulp either alone or mixed with hay, and that they thrive well on it. He has kindly sent me a sample of the pulp, the enclosure of which herewith may elicit editorial opinion.¹ It seems that, notwithstanding the prices at which some continental products are exported to England, the British farmer is in advance of his neighbours generally in the matter of stock feeding; and that the apparent cheapness of some of our importations (butter, to wit) is due (1) to adulteration—which we take no steps to prevent—and (2) to the cheaper labour available.

Possibly many will follow the advice given by M. Viger, the French Minister of Agriculture, who says, "It is an error to think that animals are condemned to perish if the hay crop fails." He recommends the storage and use of the shoots and leaves of trees, and shrubs, and says that "in France, Italy, and Spain cattle are always fed on the dried leaves of poplar, ash, elm, lime, and oak trees . . . that these constitute a forage as rich in feeding material as the best meadow hay . . . By neglecting to use these, much resource is lost to the country." The leaves and twigs should be gathered and stacked like hay. Leaves after falling in the autumn have no value as food. As a matter of fact, a herd of twenty bullocks here, in Bedfordshire, did well the greater part of June on pickings cut from elm trees. The labour of one man half the day was sufficient, the range of the cattle being on a poor hill where there was a good supply of water, but not a vestige of other food. They have now (the beginning of September) returned to this diet, to save the grass for use later on, and are doing well.

All store cattle will naturally be kept on the grass lands as

¹ This material has neither the softness nor the succulence usually associated with the term "pulp." If some fragments of ordinary straw chaff be torn *lengthwise*, the shreds thus produced will give a good idea of the "straw pulp."—Ed.

long as possible, the oldest probably all the winter, in which case a dressing on the back of some greasy waterproof mixture, which may be bought, or more cheaply prepared at home, is often used with considerable advantage. The scanty grass feeding at this time must be supplemented with cotton, or rape cake, or corn, *before the animals begin to sink in condition.*

The foregoing remarks apply generally also to sheep, with regard to which some useful hints will be found applicable to the present time in the prize essay of Mr. John Coleman, "Management of Sheep Stock on Heavy and Light Land" (Journal, Vol. I. 2nd series, 1865). In any case, in the matter of both cattle and sheep, it will probably be the aim of feeders, as an exceptional practice this winter, to supply the maximum of nourishment with the minimum of bulk; beginning this system of economy gradually, so as to allow the animal time to more or less accommodate itself to the change. It is of importance to look well in advance, and to so arrange that an uniform and regular supply may extend over the anxious months ahead.

Many hints have been given, applicable to an ordinary year, in aid of economical wintering of stock, which in this year of famine would be altogether out of place, tending as they do to the increased consumption of the very product which it is our imperative duty now to conserve.

One encouraging fact must not be lost sight of, which is that the present unusual slaughter of calves, lambs, and all animals carrying any quantity of flesh can have but one result, and that the same as followed similar proceedings in the matter of pigs two years ago, viz., improved prices as soon as the grass grows in 1894. This should be some little encouragement to the English farmer, who is now face to face with a crisis originated by unfair foreign competition, bad seasons, and rampant and unchecked adulteration, accentuated at this particular time by the most disastrous season of the century—a crisis which will be ruinous or otherwise in proportion to the ability and willingness of all classes interested to stand shoulder to shoulder in mutuality of interest for the common weal.

JOHN FRANCIS BEDDALL.

III.

All kinds of fodder—hay, straw, silage, and roots—are more scarce, and will continue to be during the ensuing winter, than the present generation of farmers has ever experienced. This follows, moreover, upon the exceptionally bad year of 1892, when all such stocks were exhausted. Thus the farmer is now at his wits' end to know how to keep his live stock, not only in

condition, but from starvation. The rains that fell at the end of July and beginning of August served in most places to relieve current anxieties, and in some way helped to prepare a more hopeful outlook for winter, as many hayricks were afterwards made, and some amount of material was grown for silage.

Catch crops, which have recently been again widely advocated, are all very well on good easy-working land, but they are not always profitable then, and in many districts are a positive loss, as the regular crop is often delayed and even lost, through land not working, and other causes. I refer to swedes or turnips, after vetches, or Italian rye grass and trifolium. We know from experience that a lot of work has to be done to prepare and clean land after such crops, and this takes time. If bad weather intervenes, the main crop is lost. Moreover, there is the general work of the farm going on, and labour means money.

However, to limit myself strictly to the text, the problem is, How to winter my stock of nearly 40 horses, 1,000 sheep, and 100 head of cattle, with little or no hay. To make the best use of the small available supply of fodder, the chaff-cutter must, I think, follow the threshing machine. Here we have a great improvement on the appliances of our forefathers, as, by attaching the chaff-cutter to the thresher, the labour of moving straw and stacking is dispensed with, all being done more easily, far better, and the chaff safely secured, at one operation. The chopped material is also much better if well trodden into a big heap—say, a good mow, as sweating softens the straw. If it further has an addition of a small quantity of fennugreek, malt dust, or dried grains—and some would add a little pulped mangel—a really valuable mass of stuff may be made from sweet straw of any kind.

The cake or corn that is intended to be given I should mix as required for use, that is, into the bags when taken to the field.

Sheep.—On the Cotswolds, sheep take the precedence of all stock, as they consume the roots where they are grown, and so prepare and improve the land for corn or other crops.

The late Mr. E. Playne, of the Downs, Chalford, many years ago showed the Cotswold farmers how lambs could be wintered and well brought out with a daily allowance of 1 lb. per head of cotton cake and plenty of roots, but no hay.

I would, however, suggest that the wether or fattening sheep should receive, say, for one hundred, 50 lb. linseed cake or crushed linseed, 25 lb. maize meal, and 25 lb. wheat meal per head per day. Every kind of stock on the farm ought to receive a portion of wheat to help get rid of this product, and so improve the price. For the ewe tugs I would use cotton

cake, instead of linseed, at the present price of 5*l.* 5*s.* per ton. To the 100 lb. of cake and meal I would add, say, 8 bushels of chaff, to be given night and morning. Such rations, with a fairly good supply of roots, will winter the tegs well. If very wet weather or very severe frost set in, an increase of dry food must be given.

The theaves, or two-teeth ewes, are generally put on roots about November. They will do with a few less roots than the tegs have, clearing up behind the lambs as well. They will receive, for one hundred, 50 lb. cake and meal, to be mixed with, say, 1 quarter bag of chaff morning and night, the corn to be increased according to the weather and the supply of roots.

The old ewes generally run the old leys and scour out stubbles, &c., until nearly Christmas, when they come in and lay behind the ewe tegs or fattening sheep, receiving a few fresh roots and a little hay, as a rule. This time it will be the general chaff with an addition of cake and meal, as required.

The greatest difficulty will be at lambing time, if no hay at all is to be had, as too much chaff always seems to tuck the ewes up, and it is more trouble to the shepherd. Consequently, if there is a load or two of hay on the farm, I expect it will find its way to the lambing pen.

It is customary to give the doubles some corn, but I think every ewe after lambing will be obliged to have something in the shape of corn or cake. I do not believe there is a better feed—as compared with hay at the present price—than dried grains, at anything under 5*l.* per ton; all my lambs are now eating them. Giving the ewes corn quickly teaches the lambs to eat, and, the sooner they get a little help, the sooner they become strong enough to stand against the many ailments sheep are liable to suffer from, especially at weaning,—the most critical period for lambs,—though if they have learnt to eat corn and cake, the process is much easier and safer.

The many lamb foods that are now supplied are most useful for young lambs, though the large farmer can buy his ingredients and mix his own, and thus save from 10*s.* to 20*s.* per ton. Whilst, however, many are thinking about it, they are very likely losing a lot of lambs, though from what cause they do not know, but it is often due to drinking too much water, and to the want of a little stimulant in the shape of corn or cake. The mortality was very great in my neighbourhood this season, when a few tons of lamb food or dried grains would, I feel sure, have saved hundreds.

Our system of fattening out the lambs, at from eight to ten months, on roots through the winter, does not necessitate the

forcing that is required to bring them out fat, such as is the practice in the neighbouring counties of Wiltshire and Hampshire, at the fairs of Stockbridge (July 10), Overton (July 18), and Britford (August 12).

The Horned Stock.—The dairy cows and calves have the best of what there is, but without hay they must all go to the chaff house. There is now a prospect of some clover silage to mix with the chaff, and some hope of a few swedes to pulp. Corn and cake of all sorts must be mixed as required.

Backward calving cows and two-year-old heifers will lay out in sheltered fields, with, I hope, nearly enough grass left for them to get a bite whilst the weather remains open. They will get a few pounds of cake or corn, and a little straw or chaff as convenient. The calves will run in yards supplied with straw, chaff, roots, meal, &c.

Horses.—Worked horses will receive 10 lb. of crushed corn per head per day, with what chaff the carters like, a few pulped swedes when these can be spared, or a little chaffed silage, racked up with cavings. Colts and brood mares not in work must lay out, and get a few tail oats with chaff. Yearlings generally have a yard, and get rather better chaff, and a bushel of oats per head per week.

All this means expense. Corn is cheap, but mutton and beef are too cheap to leave any margin for profit. The stock must be wintered, and I think if all the straw on mixed farms is converted, as I have suggested, there will be enough, but strict economy must be the rule. The prospect is better than it was a month ago, but the farmer who has least stock, and is able to sell straw and what little hay he has, will be the best off, as no feeder can make a profit with hay at 7*l.* per ton, or with straw at from 3*l.* to 4*l.* Therefore, the good farmer must look to his land'ord for help, as he will, I think, be not only doing him good, but himself in the long run, by sticking to his stock, and only parting with it when fat.

T. R. HULBERT.

IV.

The great and terrible drought of the present year has been compared to that of 1868. But it differed from that drought in many particulars. This year the dry weather set in earlier, whilst in 1868 the drought extended far into July. So the spring corn crops in 1868 were a much better plant, whilst the early roots in that dry season were a complete failure. We must go back to 1811 to find a direct parallel to the past season. Then, as now, the late-sown spring corn did not come

up until after Midsummer, whilst harvest was not ended until long after Michaelmas.

This has, indeed, been a trying season for the English farmer. The fall of 1892 was very wet, and it was with great difficulty that the autumn wheat could be sown. A month's exceedingly severe frost, with very little snow, set in on Christmas Eve, and the stiffest land at the end of January seemed likely to work beautifully. But a drenching February counteracted all the pulverising and beneficial effects of the long dry frost, and from the early days of March there was scarcely any rain for three months. The soaked and sodden land was soon converted into adamantine clods, and the consequence was that upon all retentive and unkind soils, spring grain was planted in a rough and rubbly seed-bed.

The result of the drought was most serious upon the cereal crops. Wheat stood the trial best, but, being a thin plant which had no opportunity of tillering in the spring, the crop is not equal to the yield of most dry seasons. The straw is unusually short, but of good quality, and is generally well harvested. The straw of the spring grain is still shorter, but, having so many green stems in it, should make good fodder. The first haysel was almost a total failure, and certainly not one-fourth of the usual weight of hay was cut on the arable lands. Second cuts of clover, and some late cow grasses and pastures which had been fed late, produced satisfactory August hay, and upon many low-lying meadows there was a good and heavy swathe. Where this latter hay has been well secured it will prove much better than the usual second crops, for the fine grasses and clovers hardly grew at all before Midsummer.

The dry spring was fatal to a full plant of mangel. Where a fair braird was secured, the mangel stood the early drought bravely, and revelled in the rains and heat of July and August. It should prove a good crop where the ground is covered, but taking East Anglia through there is not half a crop. Swedes are better, but still there are many districts that have a poor plant, and as the majority of the swedes did not come up until some weeks after they were drilled, the weight per acre must be small. Moreover, the glorious harvest weather of August told against the early swedes, and a dry autumn will certainly produce mildew and curtail the growth of all root-crops. Turnips are a much more regular plant, and generally promise to be a fair crop. The acreage of white turnips will be much larger than usual, for, besides the numerous fields which were intended for early roots, and could not be sown until after the midsummer rains, many fields of mangel and swedes which failed have

been resown with white turnips. There is also a great breadth of stubble turnips planted in order to make spring feed. So, upon the whole, it would appear that there is a fair prospect of sheep feed, but very few roots will be available for cattle in our stalls and yards.

A further and far-reaching loss to the arable farmer is the failure of this year's grass seeds. As a rule all sorts of clovers and most rye-grasses are a complete failure; sainfoin and kindred plants are somewhat better, but are very weak. There is, therefore, the certainty of the loss of all feed upon the new seeds this autumn and next spring, the certainty of a short crop of arable hay next year, and of a faulty ley furrow for wheat in the autumn of 1895.

Having now stated the condition of the root and fodder supply for the coming winter, it may be well to consider how the farmer can best meet these deficiencies.

In making any suggestions I am well aware that I shall be repeating much which has been better said before by many more experienced writers, and I should like my remarks to be considered as limited mainly to East Anglia, for agricultural customs are so different in other parts of England, that what may suit Norfolk would be inapplicable to Devon and even to our southern counties.

It seems right to begin with the failure of the small seeds, or new layers as we call them in Norfolk, as any attempt to remedy that evil must be done at once. But perhaps the wisest plan may be to let the stubbles alone for awhile. It is just possible that all the seed has not germinated, especially in the late barleys. But in most instances this must be a forlorn hope, as no doubt the greater proportion of the small seeds have perished. Moreover, they are such a complete failure that patching them up would do no good, and most of them must be entirely resown. Before this paper is published the proper season for sowing trifolium, rye-grass, and clovers will be passed, but it may not be too late to drill vetches, and even rye in some localities. After all there is nothing so reliable as vetches to produce plenty of feed early in the year. The seed is very dear, but vetches answer so many purposes, for soiling, hay, or folding, that they may yet prove the best and cheapest substitute for our lost clovers, and they can be followed by turnips, and then barley instead of wheat, without altering the antiquated four-course rotation which, on some estates, is still regarded with superstitious reverence.

The soundest advice, however, is to keep the best of the old seeds down for another year, applying at once the manure that

was intended for wheat, and taking a second crop of barley where the young seeds have failed. For 1 cwt. of nitrate of soda and 2 cwt. of mineral superphosphate per acre (which should not cost more than 14s.) are almost certain to produce a better crop of barley than many which have been grown this year. One great advantage of keeping the old leys down will be the valuable feed they will throw up in the autumn, especially if well dressed with farm manure, and they may be also fed in the spring much more closely than would be safe with the younger seeds. Having a smaller acreage of wheat next year may be no great loss, and then next season the two-year-old leys may come in for wheat to be followed by barley, so as to have the desired two corn crops in four years, and to restore the field to the sacred "four-course shift."

Most of the late and second crops of hay will have been secured during the fine hot weather of August, but we have reason to expect, should the autumn remain open, and continue mild and damp, a great growth of all kinds of grass and weeds until late in the year, as the ground must be thoroughly heated by the tropical warmth of the brilliant summer. Every blade of coarse grass, not only that which grows under trees in pastures, but even in plantations, and the very rushes and other weeds off banks, ditches, borders, and dykes, should be cut and made into silage. An amusing lot of tall talk was indulged in by some early and sanguine supporters of the process of ensilage, and we were told that the veriest rubbish put into a silo would be converted into most nutritious food. Only last month the Board of Agriculture informed us that "fern and bracken may be put into a silo," but it was wisely silent as to the value of the silage they would produce. On the other hand, many good farmers who have never tried ensilage are terribly prejudiced against it, mainly on account of the unpleasant smell, and one rural sanitary authority last year gave notice that a silo must be closed in consequence of its "offensive effluvia," although it was a quarter of a mile away from the nearest cottage. But it is a curious fact that, notwithstanding the sickening scent of sour silage and its exceedingly nasty look, all stock come to eat it readily, and, even when the mouldy outside portion is thrown into the yard for manure, a good part of it is eagerly devoured by pigs. But to suppose that the curing process which the forage undergoes in the silo or clamp greatly augments its nutritive value is a mistake, though it certainly does this—it renders sour grass and rank herbage, that stock would not look at in a green state, so palatable that they will eat it with relish in the winter. When good clover and the

best grasses can be successfully made into hay, they should never be ensilaged, but in wet weather even the best grasses may be thus treated, and certainly late in the year, and especially in a season like this, every effort should be made to ensilage any green herbage, and I see no reason why the leaves of our root crops should not be so secured. When mangel is stored, the crown should never be cut, and all the leaves should fall singly; hence it may be difficult to collect them in a cleanly state, and probably the ewes may this autumn be glad of them fresh in the fold. But when swedes are pitted or stored in November, thousands of acres of these turnip-tops are allowed to wither and decay, whereas in a season of scarcity, they might be preserved in silage pits or clamps for winter and spring use.

Notwithstanding the plain practical directions so opportunely issued by the Board of Agriculture upon making silo stacks and heaps, I shall venture to give my own brief experiences.

I could not afford to build a silo myself, nor did I feel so certain of its necessity that I could ask my liberal landlord to build one for me. Nor could I see the value of screws, and pulleys, and presses, as I thought I could press down and cover up the grass more cheaply. So I put down a layer of the coarsest rubbish or trimmings, and then carted the green stuff to the heap, the carts passing over it as a manure mixen is made, or, as we call it, a "drawn muck-up." Then a horse is kept continually trampling and consolidating the mass, while a man firmly treads the outsides. The heap may occupy a month in making, and when it becomes too high for a cart and three horses to haul up the loads, the ends and sides are cut down and thrown on the top, beaten down and covered with a thin layer of straw, and the whole mass is cased with 6 or 8 inches of mould or road scrapings. A garden roll may be kept on the top to close up any cracks which may result from uneven settlement. It is better on a dry subsoil to excavate the earth, the length and breadth of the intended clamp, 2 or 3 feet deep, using the mould thus thrown out to cover up the sides and top. In the wet summer of 1888 I made some clover into a silage clamp, and, instead of covering it with earth, placed a big stack of hay on the top of it. This saved the trouble of carting the mould, and the heat from the silage seemed to improve the washed hay which was placed upon it.

Then as to the best mode of using the silage. As I never give any stock long hay, and I chaff up a vast amount of straw, I find the silage is best passed through the chaff-cutter with the straw, and, if allowed to remain some hours before using, both are improved. I need hardly add that an addition of

shredded roots, with cake or meal, will be necessary for all grazing stock, but cart-horses, when hay is scarce, will do well upon the mixture if some oats or a few pulped roots are added. By far the greatest advantage the flockmaster can derive from silage is in the spring. When roots are scarce the dry provender, upon which the ewes have often to subsist, is a poor milk-producing diet. It is then that the moisture of the silage affords the greatest benefits, for its addition to the dry chaff stimulates the flow of milk, without any drawback or danger whatever to dam or offspring.

It has been a beautiful season in the Eastern Counties for harvesting our scanty corn crops. Most of the spring cereals have a large quantity of green ears, and consequently the straw should prove unusually nutritious. In fact, some oat straw is so green that it ought to be quite as good as ordinary hay, and every pound of it should be carefully preserved for fodder. Where cattle are grazed this winter in large open yards, they must be content with a somewhat dirty bed in the sheds, for only the roughest litter can be spared for the yards, and even in stalls, boxes, and covered yards the bedding must be used most sparingly.

The threatened famine of winter provender will surely revive the old controversy as to the best mode of giving roots to stock. In my young days all sheep had to break their own turnips, and the cattle had their roots thickly sliced or chopped in rough pieces with a hook. Since then roots have been cut into fingers, shredded, or pulped, and yet one of the best Norfolk graziers, at the end of his successful farming days, threw aside all his machines and gave the roots *whole* to his bullocks. His idea was that by breaking and gnawing whole roots a larger quantity of saliva was produced and digestion was thus assisted; whereas cattle are too apt to bolt a pulped mass without giving it the necessary mastication. In many districts this winter there will be hardly any roots for the horned stock, and even where they are plentiful it will be necessary to make the very most of them. So the wasteful plan of allowing grazing bullocks to eat as many turnips as they please will hardly find an advocate, even in that fruitful Goshen of our root-crops—North-East Norfolk.

There was a rage a few years ago for giving all stock cooked food. But it never became general, for although it is quite true that giving frozen turnips one day and sloppy dirty roots the next is not the way to make grazing pay, it is equally certain that to give hot food at noon and cool at night is no great improvement upon the ordinary modes of feeding. The

difficulty is to regulate the temperature with certainty, and, unless this is done, cooking or steaming roots has few advantages to cover the extra expense. But it is no great trouble to prepare and mix a great bulk of common food with more nutritious feeding stuffs, so as to produce a gentle fermentation which will "take the chill off," and render the whole mass more eatable and digestible. The best possible "seasoning" for straw or corn chaff is malt, and if that is not to be had, malt-combs or sproutings, steeped in hot water and thrown over the dry provender, make a very good substitute. Hot water entirely removes the bitter principles which are sometimes found in malt germs, and as the combs contain a considerable percentage of protein bodies, and are certainly richer in albuminoids than malt itself, they must be a very valuable cattle food. Crushed linseed treated in a similar manner is more fattening, but does not impart so much fragrance to the mass, and there is no doubt that malt possesses the great advantage of rendering palatable and digestible a large amount of coarse, unsavoury food.

In 1868 a large quantity of treacle was used for cattle food, but it has not been heard much of lately. It is considerably cheaper now than it was then, and can be purchased in London at the present time at the exceedingly reasonable price of 6*l.* 10*s.* a ton. Dissolved in hot water and poured over a heap of chaff, our lean cattle thrived fairly well upon it, but it was a nasty sticky mixture, and the treacle appeared more popular with the farm boys at breakfast time than it was with the cattle which had to eat it regularly. But if sound feeding treacle can now be bought at 10*d.* per stone, 4 lb. per day to a store bullock, eating chaff or straw *ad libitum*, would keep it in good thriving condition at 1*s.* 8*d.* per week; so no cattle need starve. Common sugar is to be had at a little over 12*l.* a ton. This may be a useful addition to our artificial cattle foods; it is certainly not so cheap as treacle, though probably much more nutritious. Englishmen have of late years had to drink a large quantity of this self-same sugar in their beer; perhaps as good and possibly a better use might be made of it by giving it to lean and hungry cattle this winter. May the enterprising stockowner who tries the experiment be enabled to extract as much profit from the use of it as the brewer has done! Probably, if his stock return him the cost of the sugar, he will be content, for there is always a vast difference between trade profits and those made by the farmer.

The coming winter must be dreaded by most stockowners. As already stated, sheep stand the best chance of being fairly

well-fed, as there are so many small turnips and so few large ones. But the farm-horses, which have been accustomed to an abundance of long hay, will find their rations terribly contracted in that particular. There will be very little hay to spare for them on many farms, and they will have to be content with small baits of oats, meal, or cut hay, and large allowances of chopped straw and corn chaff. Many of the mixtures which have been suggested for cattle may be given with advantage to farm-horses, but there must be a large expenditure for all kinds of horse corn.

The breeders of both cattle and sheep who made great sacrifices to keep their stock during this trying summer, in the hope of realising better prices in the autumn, may, we fear, be disappointed. The East Anglian farmers have little or no money wherewith to buy store stock, and, unless they are very cheap, will not purchase half their usual quantity for stall feeding. The few winter graziers who are blessed with plenty of roots are apprehensive that, in consequence of the abundant crops of all farm produce in Scotland, in the north of England and in Ireland, and the exclusion of Canadian cattle, lean stock will be too dear for them to feed at a profit. Very fresh bullocks that are nearly beef have already risen considerably in value, but young and poor cattle and store sheep are still very cheap, and likely to remain so. There is such a large area of the kingdom that has not half its usual store of hay and roots for the winter that every holder of stock will be anxious to sell, and comparatively few will be in a position to buy. Norfolk, with short straw, patchy roots, and half a hay crop, would be mad to be overstocked, even if she had the means to purchase. Suffolk is rather worse off than Norfolk, and Essex is in a still more deplorable condition. And yet every reasonable effort should be made to winter as much stock as possible, for there can be no doubt that, if we are blessed with a mild winter and early spring, both cattle and sheep are certain to command much better prices than those now current.

It is hardly possible that the last half of this cruel year can be as disastrous to the farmer as were its first six months. Already the "fore part of the back end," as our Midland brethren appropriately designate the early autumn, has greatly improved our prospects, and if the weather should remain open and moist till Christmas there is likely to be a considerable and continuous growth of grass, which may enable neat stock and breeding sheep to be kept at a comparatively trifling cost. But while hoping for the best, we must prepare for the worst, and to enforce these views this paper is written, though I feel sorry to

have given so few novel ideas as to the best mode of meeting the trials of the coming winter. But in a year like this, I know that my brother farmers tolerate any advice, however homely it may be, so I hope that among so much dust and chaff they may extract at least one grain of information or comfort. If any stockfeeder can find that one useful grain, I shall be well pleased and amply rewarded.

CLARE SEWELL READ.

V.

How to winter their cow stock is the problem which is now causing thousands of dairy farmers to metaphorically scratch their heads day after day. In my part of the county of Stafford this anxiety is neither so keen nor so general as it is a few miles to the south of us, where forage is scarce, and, indeed, in other counties which are south of the degree of latitude in which this district is situated. This section of the country is admitted by those who have travelled about to have taken less harm from the drought, and to have had better crops of hay, than perhaps any other locality to the south of it. But even here there are men whose hay crop is not more than half an average, and these it is who are now "cudgelling their brains" as to what is the best thing to do with their cattle from November to May. Others there are, not a few, who have from 70 to 80 per cent. of an average crop, and yet others—not many of these—who have one that is a fair average. And so it is throughout the district—the effects of the drought have been most variable, and, as a rule, worst of all in meadows that were eaten up late in the spring, and in such as were nipped by the late spring frosts in the valleys. Crops, generally speaking, were much better in meadows that lie away from the rivers, away up the slopes, and even on the tops of the hills.

There were little "cobs" of hay left on many farms when last winter came to an end—the drought had enabled us to save them. But as a rule they are rather diminutive, and will not count for much in the time that is coming. Yet, however, as "every little helps," they will be made the most of, and are now regarded as bits of old gold! Old hay, old straw, indeed, old anything that will serve as food for stock, possesses a higher value now than it ever did before, so far as I can recall the past. We who are now at the helm of affairs on the farms have not known a time when, so far as we can see at present, such close economy has been practised as will be the case in the coming fall and winter. It sometimes occurs that a famine foreseen is averted; there never was one more clearly foreseen than the

famine in forage which now hangs like a cloud on the horizon, and we shall do our best to avert it.

Fortunately, however, grass has grown apace in the early autumn, and while the aftermath has thriven well in the meadows, many pastures have filled up nicely with food for the fall of the year. Nevertheless, it must be remembered that grass seldom makes much headway after September sets in. Very much depends on the "grassiness" of the autumn, and on the "openness" of the weather till Christmas. These two conditions, indeed, may yet turn out to be of the highest value to livestock farmers, for, although corn and cake are cheap, it is not exactly pleasant to be compelled to buy twice or thrice as much of them as one ought to do. Our men are aware that the demand for surplus milch cattle that are going dry, and for lean cattle of any kind, whether barren or in-calf, will be even less than it was in 1887, for the simple but all-sufficient reason that the usual customers for those classes of stock have no straw or hay to spare for the purpose of wintering them. Roots, no doubt, will be pretty good, and perhaps fairly plentiful, but cattle cannot be wintered on roots alone. The fact consequently looms out that dairy farmers will either have to winter their own surplus stock as best they can, or sell them during the fall of the year at a deplorable and ruinous sacrifice.

The question therefore arises: What is the best course to pursue? In the fall of 1887, after the hot drought of the summer, cattle were abnormally low in price; and, happening to have in a barn a bit of old hay that really wanted eating, the bottom part of it being five years old or more, I thought I would try an experiment of wintering cattle on a minimum quantity of hay, and I did so because I had a fair amount of grass on the land to serve in the stead of hay. It is seldom that summer graziers winter many cattle, or indeed any, save a few cows in milk for household requirements; they prefer, as a rule, that other men, whose purpose it suits, should do the wintering. But in the fall of the year named I decided to depart from the usual custom and to try the aforesaid experiment. I bought, therefore, half a score of young barren cattle, chiefly heifers, and had them running out on the land every day, and all day, throughout the winter, unless the weather was altogether abominable. I really bought fourteen, but four of them were sold early; these, however, were replaced soon afterwards by seven or eight others, and do not interfere with the principle of the experiment. In the daytime these half-score cattle—and most of the others too—were picking up the greater part of their living on the land; in the night time they were housed and tied by the

neck, each one receiving, according to her size, from 3 to 5 lb. of decorticated cotton-cake, and a wisp of hay when it was deemed expedient, with a wisp again in the morning. Being turned out with an appetite, these cattle were not in the habit of standing about with arched backs under the fences, but were at once engaged in browsing on the grass. My farm, I may say, situated though it is in a valley, is 700 feet above sea level, and is not at all an uncommonly well-sheltered farm. If, then, cattle will do well out of doors every day in the winter on a farm like this, they will do equally well on at least half the farms in the country at large.

The cost of these cattle in cake was just about 2s. per head per week, and the cost in hay about 1s.—say, 3s. per head per week for twenty weeks, or 3*l.* each for the winter. Now, these cattle cost on the average, in November and December, exactly 5*l.* 8s. per head, and at the end of April they were worth, I considered, 11*l.* per head, showing a profit of 2*l.* 12s. per head as a reward for the trouble of looking after them during five months, and there was the additional profit of a quantity of manure. The ten heifers kept through the whole of the winter went on with the rest at “grass day,” and were sold out fat, most of them before Midsummer, and the rest in July—save one only, which was sold in August—and the average price realised was 14*l.* 8s. 6*d.* per head, or 9*l.* 0s. 6*d.* per head more than they cost in the fall of the previous year. It will be obvious to anyone practically acquainted with summer grazing that these cattle came out in good condition in the spring—as indeed they did—or they could not have been sold out fat as early as they actually were.

Now, I would ask, Why not winter barren cattle this way in the coming dead time of the year? Calves, yearlings, “twinters”—barren cattle of any age, in fact—may well be wintered in this manner, now that forage is so abnormally deficient in quantity. Lean stock must be wintered somehow, and they will all be wanted in the spring; but thousands of “half-meated” things will be hurried off to the butcher out of dread of the winter. If only the land gets fairly well covered with grass there will be something for the cattle to pull at through the winter, so long as the ground is bare of snow. As a matter of fact, easily susceptible of demonstration by anybody, barren cattle of all ages, if only the land is tolerably dry and fairly well sheltered, will go through the winter entirely out of doors if need be, provided also that they get a few pounds of cake per day, and a handful or two of hay when there is snow on the ground. If it were really cruel so to treat them, why is it con-

sidered, and rightly considered, a good thing to give a horse a winter's run? To a horse, indeed—a horse jaded by a long spell of work, satiated with corn, heated in the legs, and more or less shaky—a good winter's run is a restorative of marked value in many cases.

Straw will not be much used for bedding in the coming winter; it will all be wanted for food. Moss litter may with advantage be used instead of straw for bedding, even where straw is worth less than 4*l.* a ton. All sorts of rough grass under the trees, by the road-sides, in the plantations, and on the pastures where the land is sour, is being made into silage or into hay. Nothing of this kind should indeed be passed over as worthless; for, even if it make but sorry forage as it is, the possibility of improving it by the addition of bean, pea, maize, wheat, oat, or any other sort of meal is within the experience of most feeders. Bran, rice meal, cakes of various kinds, are all less money per ton than hay is likely to be, and indeed already is, and they must consequently be used as extensively as may be required, with the object of making hay last till “grass day”; wheat, indeed, and flour, and even loaves of bread, are being sold now at something less per cwt. than prime hay commands. Here, then, we have both choice and scope.

If any man has more hay than he will want, or can make it more by following the course suggested, let him sell it to those who are anxious to buy it. It will, in fact, be to the interest of many farmers to sell all the hay they dare to part with,—sell it in good time, and buy corn with the money. If only this sort of thing be done generally, and no gambling syndicate be formed to rush up the price of corn, there is no very great reason to dread the coming winter. As a matter of fact, our cattle must be and can be wintered, and although the shoe will keenly pinch a large number of farmers, particularly in the southern half of the country, ways and means may be found to prevent starvation, or any very near approach to it. Horses and sheep come, of course, within the scope of the remarks already made, but one naturally feels less anxiety about them than about cattle. The present crisis will have the effect of teaching farmers to be as careful of hay when it is plentiful as when it is scarce; and we may all sincerely hope that the lesson will not soon be forgotten, for these periods of scarcity are certain to occur now and again.

Town readers of the *Journal*, who are also horse-keepers, will perhaps be interested in the details of the following case. A relative of mine, Mr. Johnson, of Casson Street, E., keeps four horses for the purposes of his business. During some

thirty to forty years, he and his father before him have been horse-keepers in London, and, like many others similarly situated, have aimed at securing efficiency with economy in the feeding of hay and corn, which are serious items of working expenses in the metropolis. One leading result of accumulated experience is this: Mr. Johnson's horses eat no hay whatever, as such—that is, they receive no hay at all, save in the form of chaff that is mixed with the corn. To some men this will be a revelation, for hay in racks has been commonly considered a *sine quâ non* for horses that are stable-kept. Mr. Johnson, however, assures me that the system of feeding his horses which he has now arrived at is better than any other he has tried, that his horses work well and are always in good condition, and that virtually no need is found for medicines. The only litter is sawdust, at 4*d.* a sack.

The corn used is Russian oats, the average cost of which for a year past was 17*s.* 1*d.* per quarter of 304 lb. These oats are lighter than ours, with a larger proportion of fibrous husk, and weigh 38 lb. per bushel. No fixed quantity per horse is laid down as a regulation for the grooms, but the average consumption has been 15 $\frac{2}{3}$ lb. per horse per day. Bran is used as well, but not to any great extent; the quantity so far, though used for the most part all the year round, has been only about one-third of a lb. per horse per day. The current price of it is a trifle under 5*l.* per ton, and as hay is at least fifty per cent. higher in price per ton, more of the bran and less of the hay will now be used. Formerly the oats were macerated in water for a day or so before feeding them, but this practice has been discontinued, and they are fed in a dry and also in an uncrushed state, mixed with hay-chaff and a modicum of bran. The amount of hay used—all of it in the form of chaff—averages about 3 $\frac{1}{2}$ lb. per horse per day, or half a ton per horse per annum—a remarkably small quantity, as will be readily admitted—and the mixture of chaff, oats, and bran is not even damped when fed. That the oats should be crushed in a mill would seem to be a reform required in the *modus operandi* of this simple and economical dietary. No other kind of corn but oats and bran is used: in summer, however, the dietary includes a liberal supply of green food, and in winter of kohl rabi and carrots. The roots and greenstuff are, of course, an addition of very considerable importance, in reference not only to economy, but to the health and comfort of the horses.

The chief lesson taught by this instance of horse-feeding is the broad fact that hay, as such, is not indispensable by any means to the extent we have been in the habit of thinking, and that

we may safely aim to greatly reduce the consumption of it now that it is scarce and dear, whilst corn of various kinds is comparatively cheap, bran being a little under, and maize a little above, 5*l.*, per ton.

J. P. SHELDON.

VI.

Before entering upon the more practical part of the discussion of the all-important question as to how best, and most economically, to keep our stock during the approaching winter months, it may be well briefly to first consider the immediate cause of our present difficulty. This, of course, is mainly attributable to the long drought experienced throughout the greater part of England during the last five or six months, thereby checking vegetation, and reducing our straw and fodder crops to one-half, and our hay crop to one-fourth, of an average yearly yield. It is true that very dry seasons have been experienced in years gone by, but associated with circumstances different from those now existing, for the facilities for the transport, by land and sea, of food of all kinds, from the more favoured districts and countries to those parts most seriously affected, did not then exist. Scotland, Ireland, Canada, and many other parts of the world, are already sending fodder of various kinds to the rescue, and thus, what otherwise must have resulted in nothing short of famine, at least to our stock, will be in a great measure averted.

Looking back fifty years, farmers, throughout the length and breadth of the land, save in the immediate neighbourhood of London and other large towns, were, at that time, very strictly forbidden by covenant to sell hay or straw. Then, as the value of the commodity increased, liberty was given to sell, on condition of bringing back equivalents on the land, in artificial and other manures, and farmers began to realise that with the increasing supplies of oil cakes, and feeding stuffs of all kinds, on our markets, this could be carried out, leaving a good margin for profit. Thus gradually, instead of the former waste, more care was taken to secure the straw and fodder from damage by weather, by carefully stacking at the time of threshing, till within late years a considerable proportion is chaffed, mixed with other foods, and so rendered an important element in stock-feeding.

When a boy at home some forty-eight years since, on my father's farm (about 1000 acres), I well remember seeing most valuable hay given to the cows from the truss, in open yards and cribs, much of it being wasted, whilst all the time the

animals were treading in with their feet sweet barley straw and oat straw, given out daily by the men who were hand-threshing in the adjacent barns,—material which, if chaffed as now, and mixed with roots or other feeding stuffs, would have made excellent fodder, whilst a large portion of the hay could have been sold. Then, again, we thought it good business to supply hotel yards and other stables with straw, merely taking back the dung, without any money payment. I often in those days heard it said that a pig was the best animal to eat straw, meaning, of course, that he would not eat any, the whole going for manure. All this is very much a thing of the past; reduced prices and vanishing profits have made men wiser in their generation.

Turning now to the more important question of how best to deal with our very short output of hay and straw, it is evident that a mild open winter, with an abundance of grass in the meadows and pastures, such as I hope we may get, would prove a very great blessing, and carry us with our stock well into the New Year. Then the difficulty would be how to hold our own till May-day.

In speaking first on the question of hay as an article of consumption, the very price it is now worth in my neighbourhood, say, from 8*l.* to 10*l.* per ton, appears to me to almost render it impossible for a farmer to consume his hay to a profit, when by selling it at this high price, and spending the money in corn and other feeding stuffs, he can carry a greater number of stock, and with better results. Then comes the danger lest farmers, pressed as they necessarily must be for money, and with corn making so little, will turn the hay into cash and forget to bring back the equivalent, to the detriment alike of the cattle and of the land. Straw, again, at its present market price, and very short quantity, cannot, so far as I can see, be used for litter in the ordinary way. Much of the wheat straw will be sold, like the hay, and the barley, oat, and other straw and haulm will be chaffed for the stock. In many cases where the barley and oat crops were backward and light, it might be economy, instead of threshing, to pass the entire produce, grain and straw, through the chaff-cutter for the stock. A large area of the pea crop has been cut green and stacked, to be used as fodder in the same way.

All this must cause a very short make of farmyard dung, which will be sorely felt next spring and autumn. In districts like my own, where fern or bracken grows in large quantities, by cutting this when green and stacking it in ricks, it will help very much to keep the horses off the bare bricks

and cattle out of the mud, although possessing little or no manurial value in itself.

Another article of food, and one in ordinary seasons overlooked, is gorse, furze, or whin. I have a neighbour who for many years now has kept down a few acres of gorse. This he cuts every year in the dead of winter, putting it daily through the chaff-cutter, with a proportion of straw, and giving it to his milking cows with, to my own knowledge, good results. The top shoots of gorse, even in old coverts, might in a hard winter serve a turn.

Every opportunity is being taken for putting in, during this autumn, crops of trifolium, mustard, cabbage, rape, kale, rye, vetches, and other green crops, in addition to our very moderate crops of mangel, swedes, and turnips, to keep the sheep and cattle in the spring. The dry summer has helped us to do this with less labour than usual, the land being clean and very healthy. I think it has been noted by many farmers this season what a very useful, but somewhat neglected, fodder plant lucerne has proved itself, cutting three and even four times in spite of the dry weather, and I am confident a large acreage will be sown with it next spring; it has come up thickly in some of our newly laid-down pastures, producing feed when the finer grasses had stopped growing. What must prove disastrous next year, and tend to keep up the price of hay, is the almost total failure of the young grass seeds sown with the spring corn; in some fields they have improved a little, and everything is being done to mend them with trifolium, rye grass, and other seeds, but so far the weather is unfavourable to promote growth before cold sets in.

I have been favoured with a few hints, from one or two leading agriculturists, as to the system they intend carrying out in feeding their own stock through the winter, and think it well to give some of the proposed rations in detail.

Horses.—Wheat chaff with some oat or barley straw, cut fine, mixed with 3 bushels of the following mixture for each horse per week, adding a little salt:—1 bushel brewers' grains and 2 bushels of maize, Egyptian beans, and oats, in equal proportions. Estimated cost, 8s. per week. (In feeding horses I have found malt dust, well soaked in water, a valuable material; a proportion of roots or potatoes may be added, and less corn given.)

Milking Cows.—A small allowance of hay with oat or barley straw chaffed. Add 1 bushel bran, $\frac{1}{2}$ bushel toppings (or sharps), 1 bushel oatmeal, with a small quantity of grains and salt. Estimated cost per week, about 7s. 6d. Decorticated cotton cake may

be preferred by some to toppings. (In feeding cows the rations will be altered according as the object is to produce milk or butter. I may say the above is for butter; a greater proportion of grains would be used, with roots, and less corn, if for milk.)

Store Cattle.—These we hope to keep in the fields as long as possible, after which cut straw and roots must carry them through. Where no roots are available a little maize, pea, or bean meal can be added, or many would prefer linseed cake with straw only, having regard to the weekly cost per head. One farmer has fed largely both store and fat cattle and sheep on pure linseed oil mixed with straw chaff, varying the quantity from half a pint upwards per meal per beast; the price now quoted is 1s. 11d. per gallon on rail.

Fat Cattle.—Stall feeding will be almost impracticable, there being nothing with which to make dung, which is often the chief end to be attained. Instead of our usual fat Christmas beasts, we must carry the animals on through the winter as best we can, rather as stores, and make beef when the early green crops and grasses come in, leaving other districts—where the meadows are good enough to feed beasts fat, with the aid of artificial foods—to supply our Christmas requirements.

Sheep.—If only we get rain enough¹ to carry on the present growth of green crops, and late-sown turnips, to perfection, less difficulty may be experienced in wintering the flock than would at first sight appear. A dry flock with plenty of roots, a little cotton cake, or an equivalent in corn or malt dust, will store well, and even fatten with a little extra time given, and additional corn, which, at the present low value, and in view of the favourable terms upon which sheep at the early fairs were purchased, will leave a margin for profit.

Last year I lambed 500 ewes, producing over 600 lambs. The ewes had a very few roots drawn to them on the pastures daily, and some straw chaff in their troughs each morning till they had lambed. We had a few lambs at Christmas, the rest falling in January. I then added a little hay to the straw chaff, giving the ewes their fill of turnips, and 1 lb. linseed cake daily, and the lambs—as soon as old enough to eat it—white peas, and cake broken very fine indeed, in their troughs in front of the ewes. The hay was discontinued as the hard weather we experienced broke, and I had no difficulty in fattening the whole of the lambs, and selling them at an average price of 36s.,

¹ Everything must depend upon rain, as, unless we get it in abundance, the grass and roots will dry up, and what Berkshire, Hampshire, and other similarly situated counties will then do with sheep it is most difficult to say; it must lead to disastrous consequences.

and afterwards the ewes, these making a few shillings per head beyond the price I paid for them as stores, in addition to the clip of wool. This would seem to leave a fair living profit, but the drought, by diminishing our corn crops (grown where the sheep had fed the roots with corn and cake) one-half, leaves the balance on the wrong side. My system is to buy in a fresh full-mouthed ewe flock each year, saving my own ram lambs from the previous year's flock, thus getting fresh blood, and fattening ewes and lambs together. I have this season 640 ewes bought in at an average of 30s. per head; these were all, I hope, safely in lamb by the end of August, and ought, with ordinary luck, to pay for wintering.

I would like here to mention that, when the frost last spring broke up, our turnips had nearly all rotted, and a large proportion of our swedes also, consequently during the last month they were on them our ewes and lambs made no progress, looking sticky in their coats, and losing their bloom entirely. Fortunately we had 30 acres of common rape sown very late; this had withstood the frost bravely, and, when our ewes and lambs went on to this after the old rotten roots, the change was quite marvellous. They soon regained a thriving appearance, and we were enabled to keep them going till the end. Our shepherd, a man of long experience with a breeding flock, said he had never seen anything so marked, and was most anxious we should always have 30 to 50 acres each spring. We are now sowing in every available field common rape, and thousand-headed kale, for spring feeding. Our early-sown rape and turnips will be ready to feed off with the dry flock by the second week in September, and this, with 1 lb. linseed cake and a few split beans per head daily, will make the sheep fit for the butcher by the time the warm weather goes, and Down mutton is inquired for.

With a herd of about twenty milking cows, Shorthorns and Channel Islands mixed, the yield of butter, of rare colour and quality, from our poor pastures, all through the long dry time, has been very remarkable, the separator giving off a large percentage of cream. We calve our cows at all times in the year, in order to keep up a supply of rich milk. The cows when brought in to be milked in the morning have 4 lb. each of linseed cake in the stalls, in addition to the grass they get in the pastures. The best milker in the herd is a little cross-bred cow, got, I should think, by a common Shorthorn bull out of a very ordinary Channel Islands cow. She calved on April 15 last, rather fresh in condition, and weighed $8\frac{1}{2}$ cwt., worth at that time on the market about 14*l.* She has given

5 gallons of rich milk every day since calving till the heat of mid-August, and now it is cooler again she is coming back to her quantity. Up to the first week of September, she has yielded 12 lb. of butter weekly.

Pigs for several years past have been the most profitable animals on the farm, and while all the food they eat is of so little value when sold as grain, they will continue a good investment; at the same time it does not answer to be led away to take up any particular hobby too extensively. A farmer near me, seeing that bacon must be dear, purchased on the market a considerable number of large store hogs to fatten, with the result that swine fever broke out in the herd, entailing a very heavy loss, instead of the anticipated profit. Of course this was an unforeseen misfortune that might not occur again.

I trust that the foregoing remarks and suggestions may possibly be of some little service to those who may give the time to read them. I do not for one moment put them before the reader as anything new—nothing is new—but rather as old truths revived, and with a view to induce my brother farmers to think out the matter, each for himself, and probably thereby arrive at some system, or plan, much more suitable to the requirements of his own case than anything here set forth.

H. SIMMONS.

VII.

The question is “How best to provide for the wintering of our usual quantity of stock?” I say “usual quantity,” as to me it appears ruinous to sell at the present low values, if farmers can anyhow see their way to holding on till the dread of a severe winter has passed, and prices have hardened. Some may think that, after so dry a summer, we may have before us a mild open time, through which stock may pull with not much difficulty. But it is only reasonable to ask what will take place if we have to face a medium, or, worse still, a severe and lengthened winter.

As a matter of prudence we must provide not only for winter, but also for the possibility of a sharp winter. If roots should be injured by frost, there is no haystack and very little straw to fall back upon. After all provision has been made as to catch crops, silage, &c., and the greatest possible amount of stuff fit for consumption has been grown, the next point for consideration is, how to economise in the direction of bedding or litter. Fortunately, the straw from our corn crops, although exceedingly short, is good and sweet. On this, indeed, we place our reliance. We cannot do much without roots, but we are still worse off with neither hay nor clean straw. Possessed of the latter,

however, we can make many a good mixture, not only palatable, but life-sustaining and meat-producing. Not one straw fit for consumption, more than is absolutely necessary, ought to be wasted or used for bedding. Not that I advocate a neglected or scanty bed for the animals that we are compelled to house during the winter. This would, indeed, be false economy. When once cattle and young horses are taken from the pastures to sheltered yards a dry comfortable bed is a necessity. Every bit of rush, sedge, bracken, border grass, sprigs of young furze and heather, must be secured and reserved for litter ; while even the fallen leaves from trees will be a welcome addition to the stock of bedding stuff.

Covered yards will, this winter, be more valuable than ever, but where tenants are not fortunate enough to possess them, a thick layer of sand, crag, or burnt clay, forming a dry bottom to the yard or box, will greatly economise the straw thrown down for bedding. I have found fresh-ploughed turf carted in the cattle-yard every three or four days a good substitute for straw ; but this is more difficult to obtain on any but light land farms, and on these sand or crag is about as good, and is always available. As a last resource, both cattle and colts will winter well on a *dry* pasture, provided it is sheltered somewhat, and the fact recognised that there is no food on the pasture, and that therefore *a sufficiency must* be carried to them. A dry bottom is a great point.

At Orford Ness, about as bleak a place as any on our Eastern coast, colts have wintered (in severe weather, too) on the marshes, simply divided from the sea by some quarter of a mile of bare shingle, with no shelter beyond what a score of animals could obtain from a small haystack, which they were allowed to pull at as they chose, and which, as winter wore on, gradually disappeared altogether. They received the same amount of additional food as they would have had in a covered yard at the homestead. Bedding, however, they neither had nor required, and this was the only saving. Yet, in the approaching winter of 1893-94, a saving such as this will prove of considerable importance.

Young cattle on a sheltered pasture I have found to go through the winter equally well, and our young Red Polls have thus gained quite a rough Highland-looking coat ; but it should be remembered, and never forgotten, that *they must be fed*. The great mistake in this matter arises from the fact that the farmer is prone to think there is something to be got from the pasture, and therefore does not carry the animals a sufficiency of food, or an amount equal to what he would allow them at the homestead.

The Board of Agriculture and Mr. Martin J. Sutton did good service in publishing suggestions as to autumn crops, ensilage, &c. Having taken advantage of them, and thus made every available addition to his supply of food, and also having got together the greatest amount of bedding stuff within his reach, the farmer will be in a position to calculate how much straw he can spare for feeding purposes, and in fact to take stock of his resources; remembering that he cannot insure a growth of green stuff much before May, and also that—as spring advances—days get longer, animals grow bigger, and, with cold March winds blowing, more food will be required. At this stage how often does the stockfeeder wish that more economy had been exercised with the roots during the early winter! A condition of plenty often produces carelessness, and his constant care at this season of scarcity will be to see that his stockman does not exceed his orders. If his roots will only run to one root per day for each animal, there can be no doubt about his position later on if his stockman allows two to be consumed. These roots may prove a valuable investment, to be realised in the spring of 1894.

Once a man has accurately estimated his resources, and made choice of the many different off-the-farm foods offered by our merchants in these times of cheap corn, there ought to be no difficulty in working out the problems before us. Cattle will thrive without roots, although with many farmers these are the mainstay during winter. Sheep are more difficult to manage after a dry summer, and with little or nothing left on the pastures.

I have found treacle very useful for cows, &c., where no roots are to be had, and where straw chaff has to be used in any great quantity. This, I think, answers all the purpose of steaming the chaff, besides giving additional flavour and substance. My plan, and that of others in my district, is to mix 1 lb. per head in hot water, adding as much cold water as required to fairly saturate the heap of chaff intended for the day's consumption. To this I add from 7 to 14 lb. per head of meal, and linseed or cotton cake—mostly a mixture of all three. The choice of meal—wheat, maize, peas, or any other kind—will be determined as the market value of each varies. The treacle and water can be easily poured on with a watering-pot, and the whole should be well mixed together and left a few hours before use. If it is only intended to winter cattle for grass next spring, 7 lb. of meal will be sufficient; but, of course, this will depend upon the size of animal, &c. Treacle is of more market value now than it has been; but it will be found that growing

stock can be kept at about 3s. per head per week, if not at less cost, exclusive of straw and attendance.

ALFRED J. SMITH.

VIII.

How farmers can best carry their sheep and cattle through the coming winter months is a problem rendered the more difficult from the fact that nobody can remember a time when the country was so badly off for all kinds of fodder as at present.

In addition to this, owing to the last winter and spring being so severe and backward, farmers not only exhausted all their old stock of hay, but made a considerable outlay in the purchase of artificial food, which, unfortunately, has not proved remunerative, either in the price of stock sold during the summer or in the value of the crops just gathered. Therefore, it seems to me that many will feel indisposed—even where circumstances might permit—to be so liberal during the coming winter, whilst all will try to utilise their small amount of home-grown produce to the best possible advantage.

On the borders of North and East Dorset, where I live, there is, on some farms, not a single haystack to be seen, and on others there is only about one-fourth of the average quantity of hay which should be found at this time of the year. The roots, although an even plant, which made good progress during the month of August, cannot be expected to produce large “bulbs,” or to attain the weight per acre of ordinary years, unless there should be a continuance of showery weather throughout September. Therefore, especially in this locality, where good-sized flocks are kept, and with a small outlet for sheep, I would suggest that the old ley lands in course for wheat be left unploughed till the early spring, when oats, or even barley, may be sown. These lands should be laid up at once, and, with the hope of five or six weeks of mild and growing weather, we may expect to have sufficient grass to fold off with the early in-lamb ewes at night. I prefer the evening, as the grass would not then be frosty, and no hay would be required, but in the early morning a good supply of dry food and water should be given.

This dry food might comprise wheat straw or oat straw, and, if possible, a little hay, cut into chaff, with a mixture of bruised oats or barley, or wheat, with malt dust, dried grains, pollards or bran, a little cotton-cake, or any such cheap feeding-stuffs as may be bought at from 4*l.* 10*s.* to 5*l.* 10*s.* per ton; this should be sufficient if given at the rate of about 1½ or 2 bushels per 100 head of ewes. Then a few roots—common turnips—should

be folded off during the day, or a run might be provided on some dry pasture. This practice may be continued till the ewes are brought to the lambing-pen and have lambed, when an extra supply of cake should be added, and given twice daily, with a run out, as soon as the lambs are strong enough, on dry pasture, or ley, or stubble. The ewes should have a few roots (swedes or turnips) for a short time, and when the weather permits they should be got on the turnip land, with chaff, &c., given twice daily; whilst if the weather continued favourable, and we should be blessed with an early spring, some rye and other green food would soon afterwards be available.

Tegs or shorn hogs can be wintered—provided they have been kept well during the summer months—almost without hay, if a good supply of roots be given twice daily, with 2 bushels of cotton-cake to each 100, or about 1 lb. per head. Or, where only a few roots can be spared, some barley-straw in cribs, or cut into chaff, with a few oat-sheaves, or a mixture of malt dust, will keep them healthy. If there are no roots, and a run can be given, they should have a liberal supply of cotton-cake, and be folded on dry land, with troughs containing chaff, or some good straw in cribs.

The feeding of cattle, although perhaps not looked upon by many in this district as so serious a matter as the feeding of sheep, is nevertheless a subject of anxious concern where dairies are kept, whether on mixed farms or on grass alone.

How are the animals to be fed and sheltered, with only a small supply of straw, and much less, if any, of hay—with mangel, too, in most places, a failure?

Cows to calve early, and in full milk for the winter supply, must be housed, and well fed, at whatever cost. Cabbage, mangel, and silage are excellent for producing milk, but unfortunately there is very little of any of these this season. We must therefore hope to have a few common turnips (without the green tops) to mix with straw and what hay can be procured, cut into chaff, with an addition of meal and cake at about 6 to 8 lb. per cow. Maize meal is good, and brewers' wet grains are excellent, to give with chaff, if they can be obtained at a reasonable price and short carriage. Where there is no hay, some loose barley or oat straw, such as this year's unripened produce, will have to be given instead of hay at night, taking care at the same time that the cows get a good supply of water.

I hope that most farmers took the precaution to sow early in August on well-manured lands an extra breadth of rye or Italian rye-grass, as, if top-dressed at once, it will be found

an excellent substitute for silage and hay for early-calved cows. I think many farmers will agree with me that the price given for the winter milk, by the large milk and dairy companies, is not nearly enough to pay the producer a fair margin for the extra expense and trouble to which he will be put.

Young cattle and late in-calf cows will in many places have to be wintered in the open, and, if kept on dry sheltered pastures, will be much more healthy than if put in draughty yards with a scanty supply of bedding; such practice as the latter often leads to serious consequences. Dry, sheltered yards, and a good supply of sweet straw, with about 3 lb. of cake per head, furnish our usual means of wintering dry cattle, but this season we shall not have sufficient straw. Therefore, I suggest, where there is sheltered and enclosed pasture land, to give in troughs some straw chaff, with a little inferior corn ground, and, if conveniently obtainable, some furze or gorse (young shoots) chopped fine or bruised, which would be a great help. A less expensive way, perhaps, would be to employ some green straw of this year's growth, served out twice daily with a little cotton-cake; a few roots are good, but I do not think there will be any to spare for young cattle.

In conclusion, I am afraid that, however careful and economical farmers may be in the utilising of their feeding-stuffs, and however fortunate in the keeping and rearing of their stock, the winter of 1893-94 will prove one of considerable loss, and without the liberal aid of landlords, and better prices for stock and corn, many stock-feeders will have hard work to pull through.

TOM T. STACEY.

IX.

If the experience in Hampshire may be taken as a reliable index, our fodder and forage crops as a whole have suffered terribly through the recent severe and prolonged drought. Throughout Hampshire only about one-half the usual quantity of straw has been secured, whilst hay has suffered still more grievously, the year's supply having fallen short by quite three-fourths of the ordinary crop. But it is to be feared that the record of bad crops is not yet complete. Roots are decidedly unpromising. Mangel—probably the most valuable for spring consumption—has practically failed; and swedes and turnips are so very backward that it is hopeless to expect a fair supply of either.

The prospect is more especially discouraging to the farmers in Hampshire because they have already suffered very severely from the expensive winters of the two previous years. They

are now unable to profitably realise upon their stock, since scarcity of supply has so greatly advanced the price of the ordinary fodders that buyers of cattle refuse to purchase at anything like the usual figures, fearing that the cost of keep will make it impossible to hold stock profitably through the winter.

Farmers are therefore reduced to this position: they must either sell their cattle at a loss, or carry them through the winter with the usual but at present expensive fodders. Failing either of these alternatives, they must employ every means that experience can dictate and information can furnish to keep stock with such fodders as may afford efficient and cheap substitutes for those now so costly, and in some cases altogether unavailable.

In face of the present ruinous prices, and notwithstanding the fodder difficulty, there should be no hesitation in declaring that stock should undoubtedly be held, more especially as it may be reasonably anticipated that with the spring of 1894 prices of all kinds of stock are almost certain to advance, the reason being that, according to the official returns,¹ there has been an appreciable reduction upon last year's numbers of cattle and sheep in Great Britain.

Sheep form the most important branch of Hampshire stock-farming, and the rule of the county has been to make extensive use of clover-hay for food, the straw being converted into manure, or more usually sold. But it is apparent, that in the present exceptional circumstances, this practice must be varied to a very considerable extent. The straw, reduced to chaff, must now take its proper and rational place in the feeding of both sheep and cattle. Indeed, the scarcity of hay, and the consequent higher prices that may be obtained for it, must constrain all practical farmers to admit that it is better to sell the greater part of that which has been secured, rather than to use it altogether for feed at home; and this with stronger reason because experience has proved that for cattle the straw chaff with pulped roots makes an efficient and nutritious substitute. Certainly there need be no doubt of the nutritive character of this season's straw, as the bulk of it failed to reach the usual uniformity of ripeness. In addition, it is fortunate that all kinds of straw, as well as seed, pea, and vetch haulm, have been harvested under a scorching sun, and are consequently sweet and good for food. For their sheep Hampshire farmers will have neither silage nor roots, worth mentioning, to supply to any extent the place of the clover-hay, which it is advised that they should sell. It is therefore imperative upon

¹ See p. 655.

them to decide what fodders are best adapted to constitute the cheap and efficient substitutes suggested above. The writer's general practice, and such practice as he has observed in successful operation in Hampshire, together with the present prices of the materials now to be dealt with, point to the following:—

(1) An efficient food for sheep will be obtained by the mixture of 1 part hay, 3 parts straw chaff, and about $1\frac{1}{4}$ lb. of malt dust with $\frac{1}{2}$ lb. of cotton-cake per head.

(2) For the provision of sheep food, the present low price of barley brings it within range. Sound barley may be purchased at Southampton for from 15s. to 16s. per quarter. This will produce most food if steeped in water for about twenty-four hours. Care must be taken, however, not to use more water than the corn will absorb. After saturation, the barley should be laid upon a covered floor until it sprouts, which will occur after about three days, unless the weather be very cold. In this event it is desirable to obtain warmth by covering the corn with old bags. Barley thus prepared is a wholesome diet for cattle also, and one on which they thrive. With reasonable care as to quantity, it has likewise been used with advantage for working horses. Of course, in all the above cases, the barley must be given mixed with straw chaff.

(3) Wheat, cheap as it is, with a due proportion of straw chaff, may also be used, grittled, but sparingly at first, and increasing to nearly $\frac{1}{2}$ lb. per head. Some of the principal Hampshire farmers have already fed their sheep upon it, and with a success that will justify its employment in future years, provided that it remain as low in price as at present.

Of the foregoing foods, it may be remarked that the best, if not the cheapest, is that first mentioned. A good method of preparing the straw chaff is as follows: Cut all straw, haulm, &c., into chaff directly it is threshed, and have it well trodden into the store with a slight sprinkling of salt—about a bushel of salt to a ton of straw—and the addition of a little fenugreek or spice; though the salt must be used sparingly where breeding ewes are to be fed. Chaff so treated mellows wonderfully, and improves by being kept for a few months. It will be found that both sheep and cattle will eat it with zest.

The moderate supply of roots that may be available should be used to supplement each of the foregoing foods.

Maize would be serviceable during the coming winter if it should be as cheap as now appears probable. Cotton-cake, again, if price permit, with plenty of turnips, will make a feed upon which dry sheep will thrive. 1 lb. of cake per head daily is a fair allowance. This is a cheap way of wintering tegs, and

has the great advantage that it does not foul the land so much as hay.

Cattle in Hampshire are not nearly so important a consideration as are sheep, therefore the question of cattle food does not cause so much anxiety in this part of Great Britain as, unfortunately, it does elsewhere in the island. Certain mixtures of cattle fodder have been already indicated, but, in addition to these, Hampshire stock-holders may find the following of service. Setting aside the hay, which it is advised should be disposed of by sale, and remembering the entire lack of silage and the scarcity of roots, a good food may be obtained by a mixture of 40 lb. to 50 lb. of straw chaff, nearly 2 lb. of boiled linseed, and about 3 lb. of such home-grown ground-up wheat or barley as may be found unfitted for the market. The mass should be allowed to remain about twelve to sixteen hours before being used, as, in that time, fermentation will arise, making the whole more agreeable and more easily digested. It may here be noted that, where straw has been carted in bad condition, steaming will rob it of all flavour of mustiness, and convert it into a palatable food.

Where the farmer has been fortunate enough to secure a fair supply of roots, he will, as usual, pulp these, using about 20 lb. per head, and will mix the pulped mass with about 30 lb. of straw chaff, in addition to 2 lb. or 3 lb. of unsaleable home-grown wheat or barley, reduced to meal.

For all kinds of stock, however, required to be fattened, straw chaff and hay, in equal proportions, are generally used; but it is possible to fatten cattle by the use of a mixture of about 12 lb. of hay, 36 lb. of straw, and artificial food—consisting of crushed oats, bean meal, and linseed cake in equal proportions—increased from 7 lb. to 14 lb. per head daily.

Horses have not been so much affected by the drought as other live-stock, as some of the variety of fodders of service to them have escaped its effects; but, as oats are now somewhat expensive, it might be found advisable to substitute in great part ground maize for these, using, perhaps, about $\frac{1}{2}$ bushel of oats to 1 bushel of maize and $\frac{1}{2}$ bushel of beans per head weekly.

Since so liberal a use of straw for feeding purposes has been advised, it becomes necessary to indicate a material which may be found equally as useful as the straw for litter. Undoubtedly, peat moss, a product of the Yorkshire moors, is the best of these litters at present known. It lasts longer than the straw itself, retains more manurial properties, and, important also to notice, it requires less labour in carting and spreading on the fields. Dried fern also, though not so capable an absorbent, will be

found to be extremely useful; but, where fields afford shelter, cattle might be left out in them to a later period of the year than is usually permitted, and the store of litter, consequently, appreciably economised.

The possibility of a large extent of failure in the root crops has been already alluded to; but it is also to be feared that if the practice, too common in the South of England, be followed this year of allowing the crops to remain in the fields without protection from the frost, this failure will be accentuated. Farmers might take warning from the experience of the last two winters, during which roots were extensively rotted by the frost. It may not be out of place to urge that swedes should be taken up, and pitted in the field in quantities of about two loads each, while the turnips should be moulded up between the drills by the plough. This last is a beneficial practice common both to Scotland and the North of England.

It is to be hoped that farmers generally have taken advantage of the early harvest to sow a series of catch crops. Those who have done so will, if the winter be at all moderate, be relieved from the fear of scarcity and the necessity to purchase in the critical months of March and April, when the rye will have become fit for food. Italian rye-grass (which, in March, should have 1 cwt. of nitrate of soda sown per acre), winter barley, trifolium, thousand-headed kale, and tares will come in due succession to carry stock in safety, and with economy, to the end of July.

THOS. STIRTON.

X.

This is a subject on which I am afraid there is nothing new to be said, for every known system of feeding has been practised, and is pretty well known. But though there may be nothing new, it may be well to point out that there is a wasteful process of feeding, and also an economical process. Some people certainly get more stock kept on a given quantity of food—and get them done better—than others do, and though I do not profess to be one of them, I mean to have a good try at economy in stock-feeding this winter. The necessity for so doing is too obvious to discuss; the mere fact of hay being worth from 7*l.* to 8*l.* per ton is quite sufficient reason, without going any farther. Having in my own case commenced by selling 200 tons of hay, the problem to be solved, viz., How to winter our stock, is extremely interesting to me, as I have to winter about 400 head of cattle, 2,000 sheep, and 50 horses, with something like half the usual crop of straw, barely an average crop of roots, and with three-fourths of the hay sold.

I am hoping for a repetition of the season of 1826, respecting which I have heard my father say, "There was no hay made, and none wanted."

Without indulging in theoretical ideas about this matter, I propose as nearly as I can to sketch the plan I intend to adopt in feeding my own stock through the coming winter, which I need hardly say I look forward to with some anxiety.

It is too late to talk about what we can produce this season to help us through. Hence we have only to deal with what we have already got, or what we must buy. Many of us have a grand growth of grass, which will no doubt greatly increase yet, before the growing season is over, and which in ordinary times would be consumed on the land, but in a season like this should undoubtedly be cut, and made into silage if the weather is unsuitable for haymaking. Though grass is useful to feed on the land for store cattle and sheep through the autumn and winter, still it must not be forgotten that, so soon as the ground gets soft, at least 75 per cent. of such grass is trodden into the dirt, and utterly wasted. Again, in frosty weather, every bullock and sheep has five mouths, for they destroy as much with each hoof as they consume with their mouths. Of course, everyone would be careful to feed the grass on his wet ground first, before the land becomes sodden, and to keep his dry land for the wet weather,—in fact, if possible to clear his wet land altogether as soon as it begins to "tread." Even if there should be some grass left, this may come in most usefully in the dry months of February and March, when a good bite of old grass will often do cattle and sheep admirably, with the aid of only a small amount of dry food.

Whatever the character of the winter may be, it must be more economical to cut anything that is enough of a crop to cut, and make it into silage or hay, rather than feed it on the land. The simple process of making stack silage, by hauling the loaded carts over the heap and tipping thereon, is too well known to need description. Then there is another system which I think might be carried out conveniently this year, certainly up to Christmas, namely, to keep a piece of latter-math, or a grazing-ground recently shut up, and cut and haul the grass daily to stock in neighbouring fields. Possibly, if heavy snow fell, the grass would become rotten, but more likely—as the ground is so dry—it would this year keep good for a considerable time, and I shall certainly set apart some with the object of carrying out this plan. I have at present (first week of September) over 100 acres that have been shut up for a month or more; these will cut silage equivalent to fully 15 cwt. of hay per acre, another

50 or 60 acres will produce somewhat less, but if this growing weather continues the grass produced by this land will very much simplify my stock-keeping through the coming winter. Of course this growth of late grass is quite unusual, but almost invariably follows a hot dry summer; the tropical heat, combined with the moisture of the past month, has made grass grow as I have only known it once or twice before in my life,—1868 was the nearest approach to it.

I have not been long in making up my mind that hay at present prices is the dearest article a farmer can consume, and that unless he has a milk contract, or for some reason or other he feels bound to retain his stock, he had better dispose of it at almost any sacrifice rather than feed on hay. For this reason I sold the whole of my hay on two farms, reserving only a moderate quantity where I have a milk contract to carry out, and a few show Shorthorns, which will no doubt require a little, though the bulk of the Shorthorns will fare as “ordinary” stock.

Another conclusion I have also come to, though not without reluctance, is that the chaffcutter will have to be used extensively this year. Generally speaking, I am not a believer in the system of chopping straw and pulping roots for cattle. I think the extra cost in labour and the inferior doing of the cattle, to say nothing of the extra actual dead losses caused by indigestion, &c., far exceed the advantages derived in the greater economy of food. I think (again speaking generally) that it is better to allow cattle to eat their straw in its natural state (and the roots separately), when they will consume what is good and wholesome, and the refuse will go for litter, rather than compel them to eat a lot of indigestible stuff (positively injurious to health), and buy peat moss or sawdust for litter, or, as I have often seen, litter with straw as good as that laboriously cut into chaff to feed them. It would, in my opinion, be better to chaff the litter and feed with the long straw.

But in this season, owing to absolute necessity, everything grown on the farm must be consumed, and a deal more besides. In my own case, oats were cut green for hay, perhaps a ton per acre, and the ground planted, some of it with mustard, some with thousand-headed cabbage, which will at all events keep the sheep off the pastures at a critical time, and allow my grass to go for silage. Wheat, cut very green, was about half a crop. Winter barley, also cut very green, was a light crop. The straw of all this must be mixed with the hay, and cut into chaff, and none of the stock allowed to eat long hay. In addition to this, cows in-milk will get 10 lb. or more of artificial food, probably a mixture of bran, maize meal, and cotton cake in about equal

quantities; also a bushel of roots per day, or the equivalent in grass or silage. Cattle with any flesh upon them will be pushed forward as fast as possible for the butcher on cake and meal *ad libitum*, roots, and straw. These, for the most part, will be fed in the open fields to save litter, where, if the ground is sound, and there is a fair amount of shelter, they will do better than they would do tied up, or in yards; of this I have had sufficient experience to speak confidently. A large number of young cattle, down to yearlings, will have barley straw and cake, either in open fields or yards. We generally give 4 lb. of cake and any amount of straw; this time it will be 5 lb. of cake, and they must eat practically all the straw. Yards must be bedded with stubble cleanings, which, as worked out, will be stacked when dry, and kept dry for this purpose and for covering potatoes, &c. But open yards are an extravagant invention for the consumption of litter, and, where possible, I shall enclose the shed and confine the animals to this, only allowing them to go out in the open yards twice a day for water. Peat moss will also be used in boxes to some extent,—no straw for litter this time. Cattle under a year old will get a little hay and straw chaff, with roots, bran, and cake or beans.

In this way I hope to get through the winter without much loss or inconvenience, anticipating a sharp rise in prices next spring. I reckon that 6 cwt. of cotton cake and 1 ton of good straw, with a fair picking of grass, ought to winter a two-year-old bullock. Of course much depends on the character of the winter, but with 5 lb. of cake per day, assuming there is a fair amount of grass, he ought to require very little straw before Christmas,—6 cwt. of cake at 5s. is 1*l.* 10s., and 1 ton of straw, say at 2*l.* spending price, makes the total 3*l.* 10s. Then there is the value of the manure from the cotton cake, say 10s., which will cover cost of attendance. I think there is a very fair prospect of cattle paying well for wintering in this way.

Now comes the question of sheep keep. My ewes rarely have hay excepting in very bad snowy weather. My Shropshire flock of 230 ewes did not consume 5 tons of hay last winter, and 300 Radnors consumed even less. My practice has been for some years to keep them chiefly on grass until within a month of lambing, when they get a few roots, and about Christmas time 1 lb. of cake or corn per head, which is continued through the spring, until the lambs are old enough to eat, when they have the corn instead of the ewes. Of course, all feeders may not have suitable dry pastures in which to run their ewes, and my system would not apply to all; but I am confident that hay, even at 3*l.* or 4*l.* per ton, is extravagant feed for sheep, and that

it would be far more economical to sell even at that price, and spend half the money in cake or corn instead. My flock of Shropshires has invariably done well under this system, and I see no reason why hay should be a necessity for any other breed of sheep, if it is not so for Shropshires or Radnors.

Ewe lambs, 150, will have grass, a few roots, and $\frac{1}{2}$ lb. of cotton cake until mid-winter, when the cake will be supplemented by $\frac{1}{2}$ lb. of bran or malt dust; no hay, straw, or chaff.

My fattening sheep comprise 250 tegs. I have found 1 lb. of cake and corn per day with about 16 lb. of roots to be a fair daily ration for a fattening Shropshire teg. I never give hay, though sometimes a little chaff with the corn, but it is quite unnecessary: 1 cwt. of roots and $1\frac{1}{4}$ cwt. of cake and corn will feed out a teg in twenty weeks, during which time he should put on 32 lb. of mutton. It is pretty easy to calculate the feeding capacity of one's roots on this basis, but I know of no reason why the corn and cake should not be doubled. Certain it is that some *show lambs* are made to eat 4 lb. of cake and beans per day *before Christmas*. This, I should say, would not be economical feeding, but in a season of scarcity of roots, I am very much inclined to think that a ration of 2 lb. of cake and corn per day would be economical feeding. I cannot say what saving in roots the extra 1 lb. of cake would cause, but my impression is that fully one-third less would be required per day, and the animals would be as fat in sixteen weeks on this treatment as they would in twenty weeks on the lighter feeding. In the first case the sum would work out, say, 1 ton roots 7s. 6d., $1\frac{1}{4}$ cwt. cake and corn 7s. 6d. = 15s. In the second case, say, $11\frac{1}{4}$ cwt. roots at $4\frac{1}{2}$ d. = 4s. 2d., 2 cwt. cake and corn at 6s. = 12s., total 16s. 2d. Thus we have a fat sheep costing 1s. 2d. more, but against that there is the saving in roots, $8\frac{3}{4}$ cwt., worth over 3s., and the extra manure from the cake. It appears, therefore, that the higher feeding is the more economical, especially when we take into account the value of the manure from the extra cake feeding. This seems to me to be the line for those who are short of roots. Another 250 cross-bred tegs (Radnor and Shropshire) will "run round," having a few roots, grass, and $\frac{1}{2}$ lb. of cotton cake and malt dust—in fact, kept as the Shropshire ewe lambs are kept. So much for my Monmouthshire stock.

I have now to deal with a considerable stock of 100 young cattle and 1,000 sheep on the Cotswold Hills, about 700 ft. above sea level. In this district hay is universally considered essential for ewes in lamb, and for fattening sheep on turnips. The latter I have proved to be a fallacy, having successfully

fattened a considerable number last winter without any hay worth mentioning, and with only the smallest amount of chaff (hay and straw in equal parts), just enough to prevent their swallowing their corn too rapidly. Hitherto I have not succeeded in quite overcoming the prejudice of the shepherd (one of the best on the Cotswold Hills) in favour of hay for ewes, but it will have to be settled this winter, for, having sold all the hay, there can be no use in arguing the point. However, I shall keep a somewhat smaller proportion of breeding ewes than I at one time intended, and feed a larger number of tegs,—400 of the former, 600 of the latter. Being well off for grass, the ewes will require little else, I hope, before Christmas, when they begin roots; the young ewes may be on roots earlier, and have 1 lb. of artificial food per day, probably malt dust and cotton-cake, or whatever equivalent may be cheapest in the market. In fact, they will be kept much in the same way as my Shropshires are kept in Monmouthshire, and I expect with the same satisfactory result. Possibly I may have to give the Cotswolds in their colder country a little extra dry food; if I have to give them $1\frac{1}{2}$ lb. per day I shall not object. This will work out at a cost of 8s. per head,—say 10 lb. per week for 20 weeks, or 200 lb. at about 4s. 6d. to 5s. per cwt. Under the ordinary haying system about 4 lb. per head per day would be the ration = 1 cwt. per month = 5 cwt. for 5 months, at 7s. = 1l. 15s. I think $1\frac{1}{2}$ lb. of cake and malt dust will be fully equal to the 4 lb. of hay. Straw being very short,—about 150 tons of oat straw to winter the 100 young cattle and 15 horses,—chaffing will have to be resorted to, and a considerable expense incurred for cake; but the roots, 105 acres, promise to be good, and with grass abundant, and dry-lying for the stock, I enter upon the winter there with a light heart.

Cart-horses will, of course, have no long hay, only a little cut in the chaff. Colts and brood mares will winter out and require nothing but grass until Christmas (this applies to Monmouthshire, not to the Cotswold Hills), when most of them will no doubt require a couple of feeds of corn and chaff per day.

Such, roughly told, is my plan for wintering my stock. There is nothing new in it that I am aware of, but the main point in economy is the prevention of waste, of which there is a great amount going on constantly on most farms. I do not think farmers are sufficiently alive to the advantage of high feeding; they do not consider that it is perfectly absurd to give an animal intended for the butcher only sufficient artificial food to keep him stationary. It is next to useless to keep them *slowly* moving, for the true economy is to feed as rapidly as is com-

patible with safety. I know some farmers will say, "I don't want to hurry my sheep out, or get them over fat, because I want to shear them and sell them out of the wool;" and so they keep them about stationary for three months. I think it would be more economical to feed out the first lot quickly, and buy others to take their places. More cake and corn would be consumed, and land would be improved to an extent only understood by those who have adopted the plan. No doubt, this may appear opposed to the policy I pursue in keeping 250 tegs "round." I have, however, special reasons for doing this in the case of my cross-breds (Radnor and Shropshire), but it is beyond the scope of this paper to enter into detail on this point.

R. STRATTON.





UNIVERSITY OF CALIFORNIA AT LOS ANGELES
THE UNIVERSITY LIBRARY

This book is DUE on the last date stamped below

LIBRARY

NOV 7 1967

NOV 21 1967

QL JUN 16 1978

LIBRARY

NOV 20 1991
JUL 5 1991

Form L-9
200-1, '42 (5519)

UNIVERSITY OF CALIFORNIA
AT
LOS ANGELES
LIBRARY

3 1158 00308 6967

THE SOUTHERN REGIONAL LIBRARY FACILITY



AA 000 707 066 7

